# PLANT BREEDING ABSTRACTS

**Vol. XXX, No. 4**
**(Abstracts Nos 3379—4550)**

**Compiled from World Literature**
**by the**

## COMMONWEALTH BUREAU OF PLANT BREEDING AND GENETICS

**October, 1960**

**Commonwealth Agricultural Bureaux,**
**Farnham Royal, England**

# TABLE OF CONTENTS


| | PAGE |
|---|---|
| Statistics | 661 |
| Genetics (general studies, multiple genes, modifiers, epistasis, recombination, linkage, crossing over, hybridization, heterosis, transduction, transformation, complex loci, gene conversion, cytoplasmic inheritance, population genetics, mutation, adaptation, Mičurinism, natural selection) | 661 |
| Evolution | 674 |
| Cytology | 680 |
| Crop plants (including symposia and annual reports) | 686 |
| Cereals | 723 |
| Wheat | 729 |
| Buckwheat | 740 |
| Oats | 741 |
| Rye | 744 |
| Maize | 747 |
| Barley | 756 |
| Millets and sorghums | 762 |
| Rice | 763 |
| Forage grasses (including general studies of forage plants) | 767 |
| Leguminous forage plants | 774 |
| Roots and tubers | |
| *Beta* | 779 |
| Turnip | 780 |
| Swede | 781 |
| Potato | 781 |
| Sweet potato | 785 |
| Fibres | |
| Cotton | 785 |
| Flax | 790 |
| Hemp | 792 |
| Jute | 792 |
| *Hisbiscus* | 792 |
| Ramie | 792 |
| *Musa* | 793 |
| Sugar and starch plants | |
| Sugar cane | 793 |
| Sugar beet | 794 |
| Cassava | 797 |
| Stimulants | |
| Tobacco | 798 |
| Tea | 799 |
| Coffee | 800 |
| Cacao | 800 |
| Poppy | 800 |
| Hops | 800 |
| Minor crop plants (*Salvia*, *Capsicum*, rape, mustard, linseed, castor oil plant, sesame, sunflower, safflower, *Cassia*, *Digitalis*, rubber) | 800 |
| Fruits and nuts | 806 |
| Pome fruits | 808 |
| Stone fruits | 810 |
| Citrus fruits | 812 |
| Fig | 812 |
| *Artocarpus* | 812 |
| Nuts | 813 |
| Groundnut | 814 |
| Coconut | 814 |
| *Cornus* | 814 |
| Small fruits | 814 |
| Grape | 817 |
| Forest trees | 820 |
| Vegetables | 824 |
| Beetroot | 825 |
| Radish | 825 |
| *Allium* | 825 |
| *Foeniculum* | 827 |
| Asparagus | 827 |
| *Brassica* | 828 |
| Spinach | 830 |
| Lettuce | 830 |
| Cucurbits | 831 |
| Tomato | 833 |
| Egg plant | 839 |
| *Vicia* | 840 |
| *Phaseolus* | 841 |
| *Vigna* | 842 |
| Soya bean | 843 |
| *Pisum* | 844 |
| *Cicer* | 847 |
| Lentil | 847 |
| *Psophocarpus* | 847 |
| Sweet corn | 847 |
| Popcorn | 848 |
| Herbs, (*Mentha*, *Foeniculum*, *Coriandrum*) | 848 |
| Economic lower plants (lactic streptococci, *Streptomyces*, *Aspergillus*, yeasts) | 848 |
| Book reviews | 853 |
| Index | 871 |



© *Commonwealth Agricultural Bureaux*, 1960

The Executive Council of the Commonwealth Agricultural Bureaux is a signatory to the Fair Copying Declaration, details of which can be obtained from the Royal Society, Burlington House, London, W.1.

C. A. B.
25 OCT 1960
FILE

# Plant Breeding Abstracts

Vol. XXX, No. 4

## STATISTICS

3379 RIVES, M.
Sur la comparaison de moyennes dans les essais variétaux. **(On the comparison of means in variety trials).**
Ann. Inst. nat. Rech. agron., Paris : Sér. B 1959 : 9 : 357–76.

Duncan's multiple range test [cf. XXVI, 800]* is concluded to be both appropriate and convenient to use.

3380 KONSTANTINOV, P. N. & PLOTNIKOV, N. Ja.
**(The question of method in field experiments).**
Vestn. sel'skohozjajstv. Nauk (Rep. agric. Sci.) 1959 : No. 6 : 35–42. [Russian].

Stricter adherence to scientific method, including the use of statistics in varietal testing of crop plants and other agricultural experiments by some Soviet institutes, is urged. The journals *Zemledelie* (*Agriculture*) and *Nauka i peredovoj Opyt v sel'skom Hozjajstve* (*Science and progressive Experiment in Agriculture*) are criticized for publishing reports which give no details of the experiments and lack mathematical analysis of the data obtained.

## GENETICS

3381 SAHAROV, P. P., GUDKOVA, E. I., BUREVA, V. B. & FUDEL', T. N.
**(Heritable changes in microorganisms in the process of acquiring resistance to antibiotics and sulphamide and "dependence" on them).**
Agrobiologija (Agrobiology) 1959 : No. 3 : 362–70. [Russian].

As *Salmonella* and other microorganisms acquired improved resistance to the above substances they became increasingly dependent on them. Most microorganisms acquired resistance and dependence gradually in the entire population, but in others the final result was obtained by emergence of a few mutant types. The dependence of an organism on the synthesis of food from substances which have previously had toxic effects is regarded as evidence of a changed heritable basis. Proof that the acquired character of resistance was heritable was provided by culturing the changed microorganisms upon ordinary substrates containing no antibiotics or drug for periods exceeding 9 months before transferring them to substrates containing these substances. The microorganisms were then capable of growth in substrates with even higher concentrations of antibiotics or drug than before. This type of inheritance of resistance is referred to as "progressive".

3382 CAMPBELL, A.
**Autocatalytic particles and steady states.**
Nature, Lond. 1960 : **186** : 256–57.

It is pointed out that there is a distinction between the autocatalytic and steady-state models in microbial genetics in that the former involves an unstable steady state. The analogy between unstable steady states within a cell and genetic drift in a population is mentioned.

3383 HASHIMOTO, K.
**Streptomycin resistance in *Escherichia coli* analyzed by transduction.**
Genetics 1960 : **45** : 49–62.

The results from transduction experiments support the previous conclusion arrived at by other investigators from recombination studies: streptomycin dependence and single-step resistance to high concentrations of streptomycin are controlled by alleles at the same gene locus. Nonidentical allelism was demonstrated for *str–d* and *str–r* mutations. Reversions from independence to nonindependence (sensitivity or resistance) were due to suppressor mutations at a locus closely linked with the one governing resistance and dependence. Several nonidentical alleles were detected at the suppressor locus. The suppressor mutations were not allele specific.

3384 LEWIS, D.
**Genetic control of specificity and activity of the *S* antigen in plants.**
Proc. roy. Soc. : Ser. B 1960 : **151** : 468–77.

As previously reported, mutations of $S_4$ and $S_6$ in *Oenothera organensis* are characterized by

* References in square brackets are to volume and number of entry in *Plant Breeding Abstracts*.

complete loss of active antigen in the haploid pollen but full production of unchanged antigen in the style [cf. XXII, 900]. The interactions of the mutant alleles $S_4$ and $S_6$ with $S_2$, $S_3$, $S_4$ and $S_6$ in diploid pollen of artificially synthesized tetraploids showed, with one exception, the same characteristic patterns of dominance, recessiveness and competition as the original $S_4$ and $S_6$ alleles. In the exceptional case, $S_2$ restored the activity of $S_4$ by complementation so that the original $S_4$ protein, as well as the $S_2$ protein, was produced. The results may be most satisfactorily interpreted according to the hypothesis that the *S* gene is composed of two cistrons, one controlling the specific groupings of the protein which is active in the incompatibility reaction and the other an activator or carrier which is common to all alleles.

3385 Esser, K.
Die Incompatibilitätsbeziehungen zwischen geographischen Rassen von *Podospora anserina* (Ces.) Rehm. II. Die Wirkungsweise der Semi-Incompatibilitäts-Gene. [**Incompatibility relationships between geographical races of *P. anserina* (Ces.) Rehm. II. The mode of action of the semi-incompatibility genes**].
Z. VererbLehre 1959 : **90** : 29–52.

The genes responsible for nonreciprocal incompatibility were investigated [cf. XXV, 2790–2 and XXVII, 1012]. It was found that in compatible combinations, fertilization is quite normal but in the incompatible combinations plasmogamy does not occur, although the trichogyne is attracted by the male sex organs. Strains with the genotypes $a_1b$ and $c_1v$, progenies of the semiincompatible crosses $ab$ x $a_1b_1$ and $cv$ x $c_1v_1$ respectively, showed a reduction in growth rate. When these recombinant strains had reached a certain age, *ab* and *cv* mycelia arose by mutation. Heterocaryons from the $F_1$s of both the semiincompatible crosses were not stable when they contained genes $a_1$ and $b$ or $c_1$ and $v$; nuclei carrying $a_1$ or $c_1$ were gradually eliminated.
In crosses between other geographic races of *P. anserina*, barrages were always formed [cf. XXIV, 1679]. Recombinant types of reduced vigour and behaving like $a_1b$ and $c_1v$ strains were found amongst the progenies of the interracial crosses. Also some nuclei were always eliminated from heterocaryons.
The significance of semiincompatibility in the evolution and isolation of races of *P. anserina* is discussed.

3386 Wilson, G. B. & Sparrow, A. H.
**Configurations resulting from isochromatid and iso-subchromatid unions after meiotic and mitotic prophase irradiation.**
Chromosoma 1960 : **11** : 229–44.

Of the types of postirradiation union discussed, the most significant are those giving rise to monocentric chromosomes with triplicated segments. In the case of meiosis, the period from pachytene to diacinesis is considered to be the most suitable time for exposure to X irradiation, not only because a large number of cells would be in a suitable stage simultaneously, but also "because the successive chromosome geometries are favourable for the derivation of chromosomes with triplicated segments".
Tissues undergoing mitosis would be suitable only where there was considerable synchrony as otherwise the number of such chromosomes produced would be too low.

3387 Fincham, J. R. S.
**On the nature of the glutamic dehydrogenase produced by inter-allele complementation at the *am* locus of *Neurospora crassa*.**
J. gen. Microbiol. 1959 : **21** : 600–11.

"A method for the 40-fold purification of glutamic dehydrogenase from *Neurospora crassa* is described. Strains which are homocaryotic for the alleles $am^1$, $am^2$ or $am^3$ produce no detectable glutamic dehydrogenase, but heterocaryons of composition $am^1 + am^2$ or $am^1 + am^3$ do possess the enzyme activity. Extracts of $am^1 + am^2$ mycelia have 10%, or rather less of typical wild-type activity when assayed at about 20°. Enzyme preparations from $am^1 + am^2$ are distinguished from wild-type preparations in: (*a*) their capacity for thermal activation as the temperature is raised between 20° and 35°; (*b*) their low stability at 60°. Extracts of $am^1 + am^3$ mycelia show 20–25% of typical wild-type activity. Enzyme preparations from $am^1 + am^3$ are distinguished from wild-type in their lower affinity for glutamate, and they tend also to be more thermolabile than wild-type enzyme, though less so than $am^1 + am^2$ preparations. Experiments on mixed enzymes showed no evidence for any effect of either kind of heterocaryon preparation on the properties of wild-type enzyme, or vice versa. It thus seems likely that the effects observed are due to differences in the enzyme molecules themselves. The significance of these observations for theories on the mechanism of inter-allele complementation is discussed." [Cf. XXIX, 47].
[Author's summary].

3388 FINCHAM, J. R. S.
**A mechanism for inter-allele complementation.**
Heredity 1960 : **14** : p. 227. (Abst.).

In *Neurospora crassa*, several *am* mutants lack detectable glutamic dehydrogenase. Two kinds of heterocaryons ($am^1 + am^2$ and $am^1 + am^3$) have this enzyme. The enzyme in each case is qualitatively different from wild-type glutamic dehydrogenase, while the enzymes in the two heterocaryons are different from each other. Probably two types of complementary interaction between mutants may be encountered in studying the genetic control of single enzymes: (1) interlocus interaction, in cases in which the enzyme consists of nonidentical subunits, e.g. *Escherichia coli* tryptophane synthetase, and (2) intralocus interaction (complementation) which may affect an enzyme normally consisting of identical subunits. In (2) the subunits, which may be products of different mutant alleles and defective in different respects, may polymerize together to give a complex with some activity. Interaction (1) may be expected to result in qualitatively normal enzyme and (2) in more or less abnormal enzyme.

3389 ZINDER, N. D.
**Sexuality and mating in *Salmonella***
Science 1960 : **131** : 924–26.

"Another criterion for the presence of the agent (F) promoting genetic exchange in *Escherichia coli* was found. It involves a staining reaction of Hfr and F+ coli, but not F— coli, when mixed with strains of *Salmonella typhimurium*. This reaction was used as guide in following the transfer of the F agent to *Salmonella* and back to *E. coli*. The F agent in *Salmonella* seems to promote the same kinds of events that it promotes in *E. coli*." [Author's summary].

3390 LOEB, T.
**Isolation of a bacteriophage specific for the F+ and Hfr mating types of *Escherichia coli* K-12.**
Science 1960 : **131** : 932–33.

The specificity shown by phage stock f1 which grows only on F+ and Hfr types has not been shown by any previously characterized phage.

3391 PANDEY, K. K.
**Evolution of gametophytic and sporophytic systems of self-incompatibility in angiosperms.**
Evolution, NY 1960 : **14** : 98–115.

"1. A hypothesis has been developed to explain the relationship between the following factors and the evolution of gametophytic and sporophytic systems: (i) pollen cytology; (ii) time of nuclear action; (iii) production of pollen growth substance; (iv) cytokinesis in the pollen mother cell and (v) site of inhibition.

"2. It is suggested that the time of *S* gene action in the heteromorphic species is premeiotic whereas in the homomorphic species it is meiotic (sporophytic) or post-meiotic (gametophytic).

"3. It has been proposed that the selection for a critical amount of available metabolites in the microspore mother cell may have been one of the basic physiological mechanisms in the evolution of self-incompatibility systems. A slight excess of metabolite in the pollen mother cells would trigger a precocious *S* gene action and a chain of other reactions associated with sporophytic system of incompatibility. A critically lower concentration of metabolites would trigger a delayed *S* gene action and an alternative chain of events associated with gametophytic incompatibility.

"4. The available data suggest that the qualitative characteristics of the physiological mechanism of the expression of incompatibility reaction are under the control of the *S* gene complex, while the time of the actual triggering of the physiological chain reaction and its extent of development are controlled by certain cytoplasmic constituents of the species.

"5. According to the above hypothesis the gametophytic and sporophytic systems of self-incompatibility may be found in the same family which has simultaneous cytokinesis and has both kinds of species having either binucleate or trinucleate pollen grains.

"6. From the systematic and phylogenetic evidence it has been concluded that the homomorphic sporophytic species with trinucleate pollen evolved from the gametophytic species with binucleate pollen. The genetic implications, which support this hypothesis, have been discussed.

"7. It is suggested that the evolution of the sporophytic system of self-incompatibility from the gametophytic system occurred as a result of the progressive evolution of the microgametophyte." [Cf. XXVIII, 3643].
[Author's summary].

3392 MEDVEDEV, Z. A.
**(Biological synthesis of proteins and the problem of heredity).**
Izv. timirjazev. sel'skohozjajstv. Akad. (News Timirjazev agric. Acad.) 1960 : No. 1 : 103–26. [Russian].

Hypotheses concerning the role of nucleic acids in protein synthesis and heredity are reviewed.

3393 Geršenson, S. M. & Kok, I. P.
**(The most important problem of biology).**
Priroda (Nature), Leningrad 1960 : No. 5 : 54–56. [Russian].
A brief report on a recent Moscow conference on nucleic acids and nucleoproteins is presented. The participation of proteins in the biosynthesis of nucleic acids, bacterial transformation, the effects of ionizing radiation upon nucleic acids and the biochemistry and molecular structure of the nucleic acids were among the subjects discussed.

3394 Kohiyama, M.
**Genetic interaction observed in *Bacillus subtilis*.**
Z. VererbLehre 1959 : **90** : 347–55.
When two doubly auxotrophic mutants were plated together on certain media, small colonies were produced which may have arisen from heterozygotes or heterocaryons. The small colonies included recombinant types and others with characters not observed in the parents. These phenomena resemble those found in *Streptomyces* [cf. XXIX, 1235].

3395 Zinder, N. D.
**Hybrids of *Escherichia* and *Salmonella*.**
Science 1960 : **131** : 813–15.
Macrohomology and microhomology between *E. coli* and *S. typhimurium* were respectively studied in recombinational analysis and transduction experiments. The order of loci affecting receptors for phage (T6), lactose fermentation (*Lac*), resistance to sodium azide (*Az*), leucine requirement (*Leu*) and arabinose fermentation (*Arab*) was similar in both organisms. Transduction experiments involving genes at *Lac*, *Arab* and *Leu* showed, however, that sufficient evolutionary diversity in the finer genetic structure had developed to prevent or restrict transduction, although the genes were seemingly common to both organisms. "Apparently there have been accumulated many mutations which are relatively innocuous, in the physiological sense, but which cause sufficient diversity of genetic structure to prevent the necessary pairing over short distances prior to recombination. It may therefore be expected that individual differences relative to the 'interspecific' transduction efficiency of different genes may exist, some genes being more efficiently transduced than others."

3396 Strickland, W. N.
**A rapid method for obtaining unordered *Neurospora* tetrads.**
J. gen. Microbiol. 1960 : **22** : 583–88.
This method makes use of the natural ejection of ascospores from perithecia in groups of eight, the groups being caught on an apposed agar surface. It is a reliable method and has been found useful in collecting interference data.

3397 Harm, W.
Untersuchungen zur Wirkungsweise eines die UV-Empfindlichkeit bestimmenden Gens der Bakteriophagen T2 und T4.
**(Investigations on the mode of action of a gene determining the UV susceptibility of bacteriophages T2 and T4).**
Z. VererbLehre 1959 : **90** : 428–44.
The *u* allele in T4 as opposed to $u^+$ in T2 is responsible for the reactivation of 50% of the otherwise lethal damages induced by ultraviolet irradiation [cf. XXIX, 1184]. To bring about the T4 type of survival, the *u* allele must be within the phage-bacterium complex but not necessarily within the phage reactivated. The sensitivity of *u* relative to the total sensitivity to ultraviolet radiation of T2 is about 0·9 $\pm$ 0·2%. Lethal damages reactivated by *u* are almost identical with those reactivated by light. Damages which may be reactivated by *u* are distributed widely over the genome but not in the *r*II region.

3398 Caspari, E.
**Richard Benedict Goldschmidt 1878–1958.**
Genetics 1960 : **45** : 1–5.
An obituary account of the theoretical and experimental work of R. B. Goldschmidt in genetics and other fields is given.

3399 Dessureaux, L.
**Introduction to the autotetraploid diallel.**
Canad. J. Genet. Cyt. 1959 : **1** : 94–101.
The generalized method of diallel analysis of Dickinson and Jinks [XXVI, 2988] is extended here to the case of autotetraploid chromosomal segregation, random mating and equal allele frequency. Expressions are derived for the expected variances for parents, arrays, array means and the covariances for array family means with the nonrecurrent parents. The extent to which the regression of array covariance on array variance can be used to estimate dominance level is discussed.

3400 WINGE, Ø.
**Polymeric or isomeric genes. Some considerations on genic terminology.**
CR Lab. Carlsberg 1960 : **31** : 348–50.
With some reference to their applicability to *Saccharomyces*, Lang's term "polymeric," Plate's "homomeric genes," Johannsen's "cumulative" and "non-cumulative polymerism" and Sirks's "cumulative" and "noncumulative isomerism" are discussed.

3401 DAVIS, R. H.
**Adaptation in pantothenate-requiring *Neurospora*. I. A gene modifying pantothenate mutants.**
Amer. J. Bot. 1960 : **47** : 351–57.
The gene *m* rendered *pan*–1 and *pan*–2 mutants capable of growing in media supplemented by panthothenate concentrations which normally limit growth of these mutants.

3402 SINGLETON, W. R.
**Epistasis—what is it?**
J. Hered. 1959 : **50** : 261–63.
The original use of "epistatic" and "hypostatic" by Bateson and applications of these terms by modern geneticists are discussed. The view is expressed that the definition of epistasis given in Knight's *Dictionary of genetics* [cf. XIX, p. 427] should be followed.

3403 WEIJER, J.
**Aberrant recombination at the Td locus of *Neurospora crassa* and its Mendelian interpretation.**
Canad. J. Genet. Cyt. 1959 : **1** : 147–60.
"The data presented in this study deal with aberrant recombination between two mutational sites (*td*–3 and *td*–11) of the *td* locus of *Neurospora crassa*. Dissections of asci originating from the cross + + *td*–3 x *fl td*–11 + yielded four tetrads showing aberrant recombination brought about by a non-Mendelian ratio of the *td*–3 and *td*–11 segregates. Moreover, an increased crossing over frequency for the marker *fluffy* was observed.
"The results of crosses between the recombinant isolates of an unusual segregating ascus indicated that *td*–11 is a complex allele, consisting of two closely linked mutational sites each with a cryptomeric phenotypical effect. Absence of both components, however, will lead to a tryptophan dependent phenotype. Based on the evidence that *td*–11 is a complex allele whose components are closely linked, the interpretation of the unusual segregating asci from the cross + + *td*–3 x *fl td*–11 + becomes a Mendelian one with evidence for crossing over between the fractions of *td*–11."
[Author's summary].

3404 D'CRUZ, R.
**Calculation of linkage values by product ratio method. I. Complementary and duplicate ratios.**
Poona agric. Coll. Mag. 1959 : **50** : 146–47.
Formulae are presented for the calculation of linkage values in complex cases involving complementary and duplicate ratios.

3405 HARTMAN, P. E., LOPER, J. C. & ŠERMAN, D.
**Fine structure mapping by complete transduction between histidine-requiring Salmonella mutants.**
J. gen. Microbiol. 1960 : **22** : 323–53.
"The growth characteristics, accumulations and genetic tests carried out by means of complete transduction for over 200 independently isolated histidine-requiring (*his*) mutants of *Salmonella typhimurium* are described. Sites of mutation engendering the histidine-requiring phenotype all lie within a short chromosomal region. This region is divisible into seven smaller regions, or gene loci, each correlated with a specific physiological phenotype. The gene loci appear to be linearly arranged and are linked in the order *E*, *F*, *A*, *B*, *C*, *D*, and *G*. The five central loci are linked in an order corresponding to the sequence of reactions in the biosynthetic pathway for histidine. The functions of the two terminal loci, *E* and *G*, are unknown. The loci are nearly, or truly adjacent. A few of the sites of mutation are accurately mapped within a single gene. All the evidence is consistent with the view that processes involved in intra- and inter-genic recombination are identical. Some characteristics of multisite mutations are described. Several multisite mutations are interpreted as due to deletion of genetic material while one (*his*–57) is interpreted as due to an inversion, with or without concomitant deletion of an adjacent region. Single-site and multisite mutations exert specific effects on recombination frequencies in nearby regions."
[Authors' summary].

3406 HARTMAN, P. E., HARTMAN, Z. & ŠERMAN, D.
**Complementation mapping by abortive transduction of histidine requiring Salmonella mutants.**
J. gen. Microbiol. 1960 : **22** : 354–68.
"Determination has been made by the technique

of abortive transduction of the functional relationships of over 200 *Salmonella typhimurium* histidine mutant alleles. The results are compared with those obtained by genetic recombination [3405] and enzyme studies [3407]. The results indicate that abortive transduction tests can be used to position rapidly sites of mutation on a chromosome map within the region of a single gene. The tests for genetic complementation reveal that some genes behave as single functional units, while other genes are composed of two, and some of four, functional subunits (complementation units). The existence of mutants with overlapping, intra-genic noncomplementing patterns may allow crude mapping, solely by complementation, of some mutational sites within certain single genes. In gene *D*, the ordering of mutational sites by this technique so far conforms with that obtained by the more classic methods of map construction based on inferences derived from recombination analyses. Data are presented bearing on the individuality of the gene and the effect of mutation thereon. It is concluded that some genetic damages, localized within single genes, can secondarily affect the expression of adjacent gene(s) in addition to their primary effect upon the gene in which they are located (position effect). [Authors' summary].

3407 AMES, B. N., GARRY, B. & HERZENBERG, L. A.
**The genetic control of the enzymes of histidine biosynthesis in *Salmonella typhimurium*.**
J. gen. Microbiol. 1960 : **22** : 369–78.

"The last four enzymes in the pathway of L-histidine biosynthesis have been assayed in various histidineless mutants of *Salmonella typhimurium*. Three classes of mutants (B, C and D) have been shown to be associated with lack of imidazoleglycerol phosphate dehydrase, imidazoleacetol phosphate transaminase, and histidinol dehydrogenase, respectively. These studies, in conjunction with the genetic work of Hartman, Loper & Šerman [3405], indicate that the sequence of the genes on the chromosome corresponds to the sequence of the enzymes in the pathway of the biosynthesis. Certain mutants, which were shown genetically to behave as multisite mutants, have been shown to be missing these three enzymes. These multisite mutants are also missing a fourth biosynthetic enzyme, histidinol phosphate phosphatase, for which no single site mutants are available."

3408 MÖLLER, E.
**Über Chromatideninterferenz. (Chromatid interference).**
Z. VererbLehre 1959 : **90** : 409–20.

Examples of chromatid interference in *Neurospora*, *Sphaerocarpus* and *Funaria* described in the literature are discussed. It is shown that these phenomena may be mechanically determined mainly by the special conditions in the region of the centromere.

3409 MEVILLE, R.
**A metrical study of leaf-shape in hybrids: I. The leaf-shape of some $F_1$ hybrids and their parents.**
Kew Bull. 1960 : **14** : 88–102.

"The proposition, that the leaf-shapes of hybrids are intermediate between those of their parents, was examined metrically in four examples chosen from the genera *Forsythia*, *Prunus*, *Rhododendron* and *Ribes*.

"No exact intermediates were found in which the hybrid interaction was uncomplicated with some other phenomenon.

"The simplest type of interaction was an intergrading of characters along the leaf-axis, one parent being partially dominant towards the leaf-base and the other towards the apex, as in *Prunus* x *fontanesiana*.

"The parental effects were equally balanced in the *Rhododendron* hybrid, but there was positive heterosis on the character of relative leaf-breadth.

"In the *Ribes* (*R. sanguineum* x *R. odoratum*) hybrid axial intergrading was complicated by negative heterosis on the lengths of the large basal lobes of the leaf and positive heterosis on the breadths of the subterminal lobes.

"The *Forsythia* hybrid was found to have a leaf-shape exactly intermediate between the leaves of the simple leaved parent and the terminal leaflets of the other parent which has both simple and trifoliolate leaves.

"The concepts of positive and negative heterosis are discussed." [Author's summary].

3410 BOWMAN, J. C.
**Recurrent selection. I. The detection of overdominance.**
Heredity 1960 : **14** : 197–206.

It is shown that a negative regression between (1) the performance of a sire's test-cross progeny and (2) the performance of either his full sisters or his pure strain progeny can only occur when overdominance is present, though a zero or negative regression does not necessarily imply absence of overdominance.

3411 Buttin, G., Jacob, F. & Monod, J.
Synthèse constitutive de galactokinase consécutive au développement des bactériophages λ chez *Escherichia coli* K 12. (**Constitutive synthesis of galactocinase following the development of λ bacteriophages in *E. coli* K12**).
CR Acad. Sci., Paris 1960 : **250** : 2471–73.

When $Gal^-_{1,2}$ bacteria, which are unable to synthesize galactocinase and galactose transferase, are lysogenized by the defective prophage ($\lambda Gal^+$), synthesis of the enzymes can be induced in them as in normal bacteria carrying $Gal^+$. In $Gal^-_{1,2}$ bacteria infected with $\lambda Gal^+$ particles, synthesis can similarly be induced but can also occur in the absence of any exogenous inducer, i.e. the gene behaves as a constitutive gene unaffected by a repressor [cf. XXIX, 46]. The effect, termed derepression, is increased by ultraviolet irradiation of the lysogenous culture $Gal^-$ ($\lambda Gal^+$). In lysogenous $Gal^-_{1,2}$ (λ) bacteria infected with $\lambda Gal^+$ particles, synthesis is not induced except after ultraviolet irradiation, i.e. only in bacteria which are no longer immune against λ. When $Gal^+$ bacteria are infected with λ, synthesis does not occur, even after irradiation. But if a lysogenous culture $Gal^+$ (λ) is irradiated, phage multiplication is accompanied by synthesis. It is therefore thought that the $Gal^+$ determinant is either integrated with or closely linked with the virus genome. It is further noted that irradiation of the lysogenic culture $Gal^+$ (21) is without effect, presumably because prophage (21), although similar to (λ) in many properties, is situated at a greater distance from the *Gal* segment in the bacterial chromosome. Preliminary experiments indicate that the derepression effect occurs only when prophage (λ) and $Gal^+$ are in the *cis* position with respect to one another.

3412 Rouhandeh, H.
**Comparison of stable and abortive transduction in an adenine-requiring mutant of *Salmonella typhimurium*.**
Diss. Abstr. 1959 : **20** : LC Card Mic 59–3000 : 851–52. (Abst.).

Experiments were undertaken to distinguish between the following possibilities: (1) abortive transduction, in contrast to stable transduction, is a case in which donor genetic material fails to undergo any interaction with the recipient genome, or (2) stable and abortive transduction are alike in that the donor genetic material undergoes alignment and interaction with the recipient genome. The effects of physical and chemical agents on the frequencies of transduction and on the ratio between the frequencies of abortive and stable transduction were determined. Frequency of transduction was increased by several procedures: mild ultraviolet (UV) irradiation of recipients; mild UV exposure of transducing phage; treatment of recipients with ethylenediamine tetraacetic acid; treatment of recipients with chloromycetin; increase in multiplicity of infection, even though non-transducing phage was used; lowered temperature; and use of young cells (4–8 hr. old) as compared with 24-hr.-old bacteria. The ratio of abortive to stable colonies remained fairly constant at 10 : 1 in experiments with sensitive recipients, regardless of the treatment, except in two cases. In experiments with lysogenic recipients, the ratio of abortive to stable colonies rose to 20 : 1, irrespective of the treatment or whether temperate or virulent phage was used. In each case in which the frequency of stable transduction increased, the frequency of abortive transduction also increased. Transduction frequencies were unaffected by treatment with nitrogen mustard, colchicine, $MnCl_2$, 3-methylchloroanthrene, 3-methyldimethylamine and acriflavine; the ratio of abortive to stable transductions usually remained constant. It is concluded that the results favour possibility (2).

3413 Watanabe, T.
**Transductional studies of thiamine and nicotinic acid requiring streptomycin resistant mutants of *Salmonella typhimurium*.**
J. gen. Microbiol. 1960 : **22** : 102–12.

Using strain LT–2 of *S. typhimurium* it was found that streptomycin resistance, slow growth, and thiamin and nicotinic acid requirement were converted to streptomycin sensitivity, fast growth and prototrophy in a single step by means of temperate phage PLT–22 grown on wild-type bacteria, prototrophic one-step intermediate streptomycin-resistant mutants or streptomycin-indifferent mutants [cf. XXIX, 1129]. The characters did not segregate and are concluded to be controlled by a single locus. It is considered that these auxotrophic mutants result from mutation at multiple sites within the locus. The mutants varied in their resistance to streptomycin and in their mutation rates. No linkage was found between the streptomycin-indifference locus and the locus controlling streptomycin resistance, nor was any linkage found between the mutant locus and other loci determining auxotrophy.

3414 Marmur, J. & Lane, D.
**Strand separation and specific recombination in deoxyribonucleic acids: biological studies.**
Proc. nat. Acad. Sci. USA 1960 : **46** : 453–61.

"DNA from [*Diplococcus*] *pneumoniae* when heated to temperatures where all the molecules are denatured still retains transforming activity. The activity is increased by slowly cooling the denatured DNA as well as by increasing the ionic strength and concentration of DNA during the cooling period. The reunion of the strands is specific and has been shown to occur between populations of denatured molecules of mutant strains of *D. pneumoniae*. The reunion does not occur between the DNA strands of pneumococcus and that from *Streptococcus* D or from organisms with widely varying base ratios. Hybrid molecules in which one strand contains the mutant marker and the other strand derives from wild-type DNA are active in carrying out transformations with respect to the mutant property." [Authors' summary].

3415 Doty, P., Marmur, J., Eigner, J. & Schildkraut, C.
**Strand separation and specific recombination in deoxyribonucleic acids: physical chemical studies.**
Proc. nat. Acad. Sci. USA 1960 : **46** : 461–76.

"When solutions of bacterial DNA are denatured by heating and then cooled, two different molecular states can be obtained in essentially pure form depending on the choice of conditions, that is, rate of cooling, DNA concentration, and ionic strength. One state corresponding to fast cooling consists of a single stranded DNA having about half the molecular weight of the original DNA. The other state corresponding to slow cooling consists of recombined strands united by complementary base pairing over most of their length. This form has as much as 50% of its original transforming activity and is called renatured. The quickly cooled, single stranded form is essentially inactive and is called denatured. These two forms are clearly identified by differences in (1) absorbance-temperature curves, (2) density, (3) appearance in electron micrographs and (4) hydrodynamic properties. The recombination depends on concentration in the manner expected for an equilibrium between two independent strands and a bimolecular complex.
"Density gradient experiments on $N^{14}$ and $N^{15}$ *E. coli* DNA have shown the existence of hybrids in the DNA renatured from the mixture. Similarly, hybrids have been shown to form between strands of bacteria that are closely related genetically. Thus the possibility of forming by renaturation heterozygous DNA molecules with different genetic markers or chemical modifications in the two strands seems assured." [From authors' summary].

3416 Pakuła, R., Hulanicka, E. & Walczak, W.
**Inhibition of transformation in *Streptococcus sbe* by desoxyribonucleic acids of different origin.**
Bull. Acad. polon. Sci. : Sér. Sci. Biol. 1960 : **8** : 49–55.

In studies of transformation, in which *Streptococcus sbe* was used as receptor and DNA from a streptomycin-resistant strain as transforming principle, it was found that genetically inactive DNA from *Escherichia coli* decreased the activity of the transforming principle, the amount of the decrease depending both on the ratio ($K$) of transforming to nontransforming DNA and on the concentration of the transforming DNA. Inhibition was highest with $K$ values of $10^{-4}$–$10^{-1}$ and concentrations of $10^{-3}$–$10^{0}$ mcg./ml. transforming DNA; higher values of either gave higher degrees of transforming activity. Genetically inactive DNA from other bacteria and also from calf thymus had closely similar inhibiting effects. Inhibitory activity was reduced by heating up to 100° C. and was enhanced by ultraviolet irradiation.

3417 Opara-Kubińska, Z.
**Investigations on bacterial transformations. I. Influence of centrifugation on the transformation ability ("competence") of *Diplococcus pneumoniae* cells.**
Bull. Acad. polon. Sci. : Sér. Sci. Biol. 1959 : **7** : 433–37.

Centrifuged cells of streptomycin-sensitive *Diplococcus pneumoniae* R36A showed a higher degree of aggregation and, after treatment with transforming principle from a streptomycin-resistant form of the same strain, a greater proportion of transformed bacteria than non-centrifuged cells. This effect was not observed in the absence of albumin and Ca and $PO_4$ ions, known to be cofactors for transformation. It is thought that the electrical discharge occurring at the surface of the cells during their aggregation is connected with an increased absorption and penetration of the transforming principle into the cell.

3418 Opara-Kubińska, Z.
**Investigations on bacterial transformations. II. Influence of Tween 80 on the transformation of streptomycin-resistance of pneumococci.**
Bull. Acad. polon. Sci. : Sér. Sci Biol. 1959 : **7** : 439–43.

The above nonionic detergent (polyoxyethylenosorbitan), has a dispersing effect and, when added to the medium containing the streptomycin-sensitive receptor *Diplococcus pneumoniae* R36A at least 20 min. before the addition of transforming principle from resistant R36A, appreciably decreased the number of transformations; it was also able to counteract the effect of centrifuging [cf. 3417]. There was no toxic action. It was also observed that the smaller the quantity of detergent added, the earlier the peak of competence was reached.

3419 Rizet, G., Engelmann, N., Lefort, C., Lissouba, P. & Mousseau, J.
Sur un ascomycète intéressant pour l'étude de certains aspects du problème de la structure du gène. (**On an ascomycete of interest to the study of certain aspects of the problem of gene structure**).
CR Acad. Sci., Paris 1960 : **250** : 2050–52.

*Ascobolus immersus*, which has the advantage of large ascospores which are readily isolated and germinated, is described as suitable for genetic studies. Tetrads with spontaneous mutants occur at a frequency of about $10^{-3}$. In a study of recombination among almost 300 monogenic mutations affecting spore size, form or pigmentation, the mutants fell into a number of groups or series, in each of which the mutants are phenotypically similar and give few (up to 1%) or no recombinants when crossed with one another. Each series thus corresponds to a complex locus, the various mutants of which behave as homoalleles or heteroalleles.

3420 Lissouba, P. & Rizet, G.
Sur l'existence d'une unité génétique polarisée ne subissant que des échanges non réciproques. (**On the occurrence of a polarized genetic unit which undergoes only nonreciprocal exchanges**).
CR Acad. Sci., Paris 1960 : **250** : 3408–10.

Crossing of two mutants in *Ascobolus immersus* within a series results in a very low number of recombinations [cf. 3419]. In a series of seven mutants, it was found that: crosses between identical mutants gave no recombinants or reverse mutations; most crosses involving *B* gave no recombinants; tetrads with four white and four black spores were almost absent; and black spores occurred in pairs in the ratio 6 mutant : 2 black. An analysis of the frequency of this last ratio for the individual crosses allowed the position of the various mutants within the complex locus to be determined. These tetrads gave the following progenies: one wild-type, two of one parental type ($P_1$) and one of the other ($P_2$); there were no reciprocal recombinations. It was further found (*a*) that in any one cross, the same mutant always behaved as the $P_1$ type, although in different crosses it might behave differently; and (*b*) that in each cross the $P_1$ parent was the one whose position on the gene map was further towards the left. The genetic unit comprising these mutants thus appears to have a polarized structure and is therefore termed a polaron. One of the mutants, *B*, did not fit into the scheme; being an X-ray induced mutant, it may have carried a deficiency.

3421 Winge, Ø.
**Priority in gene-conversion.**
CR Lab. Carlsberg 1960 : **31** : 343–47.

Lindegren has published a paper [cf. XXIX, 2185] whose purpose was to "to point out that a phenomenon operationally indistinguishable from Winkler's gene-conversion has recently been 'discovered' by many others all of whom fail to quote any of Renner's papers. Each of the 'discoverers' of gene-conversion invented a new and different name for the phenomenon." In this connexion Lindegren criticized the term interallelic crossing over, used by the present author, who points out that this is an entirely different concept since it involves a partial exchange between two alleles and not a complete replacement of a gene by its allele. The danger of assuming that two "operationally" similar phenomena are identical is stressed. Attention is also drawn to the author's suggestion, published in 1917, that diplophase provides the opportunity for making good any genic loss incurred during haplophase. If a gene *b* is missing in the chromosome from the ♀ parent, *b* might be replaced by the corresponding gene *x* from the ♂ parent during chromosome pairing. It is however pointed out that this hypothesis differs fundamentally from Winkler's.

3422 Watson, G. S. & Caspari, E.
**The behavior of cytoplasmic pollen sterility in populations.**
Evolution, NY 1960 : **14** : 56–63.

"A mathematical model has been developed for

a population of plants in which pollen sterility is dependent on a cytoplasmic factor and one pair of Mendelian alleles. The following conclusions can be drawn:

"1. The ratio of the two cytoplasms in the population will remain constant.

"2. The relative frequencies of the two alleles in the two cytoplasms will tend to equality.

"3. The plasmon-sensitive allele involved in the production of pollen-sterility will be selected against and be eliminated.

"4. The equilibrium conditions are given for the case that selection against a plasmon-sensitive gene is counteracted by mutation to the plasmon-sensitive allele.

"5. Female sterility induced by interactions of a cytoplasmic factor and a nuclear gene leads to selection against the cytoplasm and the plasmon-sensitive gene, and to elimination of both.

"The bearing of the model on actual observations with cytoplasmic pollen sterility is discussed." [Authors' summary].

3423 Page, A. R. & Hayman, B. I.
**Mixed sib and random mating when homozygotes are at a disadvantage.**
Heredity 1960 : **14** : 187–96.

Earlier papers [XXIV, 26 and 27] have considered the approach to equilibrium of populations in which the homozygotes are at a disadvantage and in which the breeding system is either earlier inbreeding or a combination of selfing and random mating. The present paper extends these results to cover a combination of sib and random mating. The types of equilibrium obtained for various proportions of sib and random mating are illustrated by phase diagrams and are compared with those obtained for the combination of selfing and random mating.

3424 Seyffert, W.
Theoretische Untersuchungen über die Zusammensetzung tetrasomer Populationen. II. Selbstbefruchtung. (**Theoretical investigations on the composition of tetrasomic populations. II. Self fertilization**).
Z. VererbLehre 1959 : **90** : 356–74.

By calculations involving matrices, it is shown that double reduction reduces the degree of heterozygosity in tetrasomic self-fertilized individuals. It interacts with selection against recessive genotypes, reducing the effect of selection. The extent of this interaction increases with increasing intensity of selection. The decline of heterozygosis is much slower in tetrasomics than in disomics and selection against a homoallelic zygote or gone genotype in tetrasomic inheritance has a greater effect in maintaining heterozygosity than in disomic inheritance.

3425 Latter, B. D. H.
**Natural selection for an intermediate optimum.**
Aust. J. biol. Sci. 1960 : **13** : 30–35.

A mathematical study is presented of the equilibrium resulting from selection for an intermediate metric character and recurrent mutation at the loci determining this character, assuming additive effects. It is concluded that mutation alone can account for only a small proportion of the genetic variance commonly encountered in natural populations which, presumably, results from heterozygote superiority.

3426 Burnett, J. H.
**In- and out-breeding in higher fungi.**
Heredity 1960 : **14** : p. 222. (Abst.).

Reference is made to investigations on species of *Coprinus*, *Polyporus* and other fungi with respect to (1) numbers and stability of mating-type factors in natural populations, (2) size of breeding populations and nature of the mycelium and (3) genetically imposed inbreeding.

3427 Kubitschek, H. E.
**The error hypothesis of mutation.**
Science 1960 : **131** : p. 730.

"Accumulation of mutants [of *Escherichia coli*] in glucose-limited chemostats is proportional to growth rate, while in tryptophan-limited chemostats it is independent of growth rate. This behavior, which implies the failure of the error hypothesis, may be explainable on the basis of a unitary hypothesis: the results with glucose may be due to reversion or loss of latent mutants." [Author's summary].

3428 Miyake, T.
**Mutator factor in *Salmonella typhimurium*.**
Genetics 1960 : **45** : 11–14.

A mutator gene (*mut*) in *S. typhimurium* 'LT-7' affected the stability of all markers with which it has been tested [cf. XXIX, 3381]. The gene increased the spontaneous mutability of different alleles at the same locus (*tryB*) in *S. typhimurium* in different degrees. About 40% of the cells of LT–7 carried *mut*, which was situated to the left of *thr-leu*.

3429 Toropanova, T. A.
**(The mutation process in populations).**
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1960 : **132** : 460–63. [Russian].
Evidence on substantial differences in mutability between *Drosophila* populations from different habitats was obtained. A hypothesis that selection of homeostatic systems of adaptive genes has great importance for the evolution of mutability is put forward and discussed.

3430 Ryan, F. J.
**Bacterial mutation in a stationary phase and the question of cell turnover.**
J. gen. Microbiol. 1959 : **21** : 530–49.
According to the hypothesis of cell turnover in the stationary phase, some bacteria lyse and thus provide histidine to others, which grow and replace the fraction of the population undergoing lysis. It is presumed that mutation to histidine independence ($h^+$) takes place during this cryptic growth. During a stationary phase induced and maintained by the exhaustion of histidine, the total number of $h^-$ bacteria (*Escherichia coli*) remained constant, as did the microscopic appearance of the cultures. Mutations to the $h^+$ condition occurred only in the presence of a carbon source. Mixtures of $h^-lac^+$ and $h^-lac^-$ cells in a lactose medium did not show population shifts. Penicillin did not prevent $h^+$ mutation. These results are not in conformity with the hypothesis of cell turnover. It is concluded that no division occurred and suggested that mutation resulted from errors in the replication of genetic material which was undergoing molecular turnover within the nondividing cells.

3431 Gorini, L. & Kaufman, H.
**Selecting bacterial mutants by the penicillin method.**
Science 1960 : **131** : 604–05.
"Certain improvements are described in the use of penicillin for isolating auxotrophic mutants of bacteria. By obtaining exponential growth before the penicillin is added, and by minimizing the duration of the treatment, cross-feeding is decreased and much denser populations can be screened. These modifications have made it possible to obtain, with regularity, mutants of *Escherichia coli* blocked in a desired step in arginine biosynthesis."
[Authors' summary].

3432 Ryan, F. J., Rudner, R., Nagata, T. & Kitani, Y.
**Bacterial mutation and the synthesis of macromolecules.**
Z. VererbLehre 1959 : **90** : 148–58.
Mutation of histidine-starved *Escherichia coli* from a histidine-dependent condition to a histidine-independent condition occurred in the absence of chloramphenicol but not in its presence unless a mixture of aminoacids was also added to the culture.
It is thought that, in the absence of chloramphenicol, the aminoacids increase the rate of mutation by accelerating the rate of gene replication and that, in the presence of chloramphenicol, they enable gene replication to take place, the mutations occurring at a rate determined by the turnover of genetic material.

3433 Smith-Keary, P. F.
**A suppressor of leucineless in *Salmonella typhimurium*.**
Heredity 1960 : **14** : 61–71.
[Cf. 967].

3434 Banič, S.
**Isolation of radiation-resistant mutants of *Escherichia coli* by replica plating technique.**
Caryologia 1959 : **11** : 404–06.
The spontaneous origin of X-ray resistant mutants noted by Witkin [XVII, 1584] is confirmed.

3435 Auerbach, C.
**Spontaneous mutations in dry spores of *Neurospora crassa*.**
Z. VererbLehre 1959 : **90** : 335–46.
Using Atwood's method, recessive lethals were scored in a heterocaryon with an amycelial component; the conidia were stored dry at 30° and 4° C. and tested every few weeks for seven months. At 30° C. the mutation frequency increased in linear proportion to time, the increment per week being 0·3%. At 4° C. the rate of mutation was much lower and the data were not suitable for mathematical analysis of the trend. Conidia which had been kept for 24 weeks at 4° C. were transferred to 30° C. and the proportion of lethals rapidly increased to that shown by conidia which had been kept at 30° C. throughout the experiment. These results are thought to indicate that under the experimental conditions the mutational process consisted of several steps, the final one having a high temperature coefficient. It is also thought that none of the lethals were present in the original culture and that they did not arise by errors in gene replication.

Conidia which had been kept at 30° C. were transferred to growth tubes; 80% of the accumulated lethals were lost during the initial stages of growth but subsequently lethals accumulated at a rate which remained constant for at least two weeks.

3436 Momose, H. & Ikeda, Y.
**Isolation of mutants of *Bacillus subtilis* requiring D-glutamic acid.**
Nature, Lond. 1960 : **186** : 567–68.
Mutants all requiring d-glutamic acid for growth but differing in response to aspartic acid, alanine and l-glutamic acid were isolated after X irradiation.

Ernst-Schwarzenbach, M.
Neunzehnter Jahresbericht der Schweizerischen Gesellschaft für Vererbungsforschung Société Suisse de Génétique (S.S.G.) 1959. (**Nineteenth Annual Report of the Swiss Society for Genetical Research 1959**).
Arch. Klaus-Stift. VererbForsch. 1959 : **34** : 193–219.

3437 *Fritz-Niggli, H. Neue Erkenntnisse der experimentellen Strahlengenetik.* (*New knowledge of experimental radiation genetics*). (*pp. 200–19*).
The physical and chemical phenomena involved in radiation-induced mutation and the effects of various factors on mutation rate are discussed with reference mainly to work on *Drosophila*. A diagram of the mutation process is given.

3438 Angulo Carpio, M. D.
Acción de agentes físicos en citogenética (Notas bibliográficas). VI. [**Action of physical agents in cytogenetics (Bibliographical notes). VI**].
Genet. iber. 1959 : **11** : 251–70.
This further list of references [cf. 1087] is arranged under the headings: X rays; X rays combined with other radiations; X rays combined with other agents; other types of radiation; mechanical and thermal agents; ultrasonic treatment; and physical and chemical agents.

3439 Rapoport, I. A. & Kostjanovskij, R. G.
(**Mutagenic activity of some choline esterase inhibitors**).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1960 : **131** : 191–94. [Russian].
Mutagenic effects of some choline esterase inhibiting agents, in particular the fluoranhydride of the isopropyl ester of methylphosphoric acid upon *Drosophila*, were studied. The above chemical proved highly effective in inducing mutations.

3440 Rudner, R. & Balbinder, E.
**Reversions induced by base analogues in *Salmonella typhimurium*.**
Nature, Lond. 1960 : **186** : p. 180.
Cells were treated with (1) 2-aminopurine or (2) 5-bromouracil together with the folic acid inhibitor aminopterin which is known to render the cells thymine-deficient. Both treatments raised the frequency of reversion at locus *Try-D* from auxotrophy to prototrophy. In the absence of aminopterin, 5-bromouracil was ineffective. The alleles at *Try–D* showed a quantitative differential response to the same mutagenic treatment but, with one exception, all mutants induced to revert by (1) also underwent reversion as the result of treatment with (2). Evidence was obtained that 5-bromouracil is incorporated into DNA, specifically replacing thymine. Data on the incorporation of 2-aminopurine are not available. Fewer reversals were recovered by plating on unsupplemented minimal agar than on enriched minimal agar, on which the cells divided a number of times. Support was therefore gained for Freese's hypothesis that errors in base pairing which the analogue may undergo in subsequent DNA replication play a role in the origin of mutations [cf. XXIX, 3406].

3441 Rapoport, I. A.
(**The mutagenic effect of 1,4-bis-diazoacetylbutane**).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1960 : **130** : 1134–37. [Russian].
The addition of the above chemical to the food for *Drosophila* induced frequent mutations. Observations on the fertility of the insects suggest that the new mutagen caused only about a third of the chromosomal aberrations which occur from treatments with X rays or neutrons.

3442 Zetterberg, G.
**The mutagenic effect of 8-ethoxycaffein, caffein and dimethylsulfate in the *Ophiostoma* back-mutation test.**
Hereditas, Lund 1960 : **46** : 279–311.
The influence of treatment with 8-ethoxycaffeine (EOC), caffeine, dimethylsulphate (DMS) and ultraviolet radiation (UV) upon rate of back mutation of biochemical variants of *O. multiannulatum* was investigated. In general, the

greatest increase in frequency over the spontaneous rate of reversion was obtained with UV, DMS usually being a much weaker mutagen. Caffeine treatment did not lead to any definite increase over the spontaneous frequency. A gene-specific effect was found for EOC, DMS and UV. The importance of genetic background in the mutability of a given gene in response to the same agent was also demonstrated. The supposition that mutagens may have an indirect mode of biochemical action is accepted and applied in a comparison between the mutagenicity of EOC and DMS.

3443 Chevallier, M.-R. & Luzzati, D.
Action mutagène spécifique de trois peroxydes organiques sur les mutations reverses de deux loci de *E. coli* 15T-9–13. (**Specific mutagenic action of three organic peroxides on the back mutations of two loci of *E. coli* 15T-9-13**).
CR Acad. Sci., Paris 1960 : **250** : 1572–74.

Succinic peroxide induced a high rate of mutation from *Pro*$^-$ to *Pro*$^+$, cumene peroxide a high rate from *Try*$^-$ to *Try*$^+$ and thymine peroxide moderately high rates for both loci.

3444 Lundgren, D. G. & Beskid, G.
**Isolation and investigation of induced asporogenic mutants.**
Canad. J. Microbiol. 1960 : **6** : 135–51.

Four mutants of *Bacillus cereus* var. *lacticola* induced by ultraviolet treatment were non-sporulating at 37° C. Three of them were temperature sensitive, since they sporulated at 28° C. The induced metabolic lesions interfering with sporulation had no effect upon growth, except in the temperature-insensitive strain, which had a partial requirement for aminoacids. Inhibition of sporulation was partially counteracted when casein hydrolysate and some low molecular-weight substances involved in protein synthesis were added to the medium.

3445 Kaplan, R. W., Winkler, U. & Wolf-Ellmauer, H.
**Induction and reversion of c-mutations by irradiation of the extracellular $\kappa$-phage of *Serratia*.**
Nature, Lond. 1960 : **186** : 330–31.

Evidence has been obtained that the lesions induced by ultraviolet radiation in free phage, causing c (clear-plaque) mutations, are photoreversible premutations residing most probably in the phage DNA. Support was therefore gained for the hypothesis of the direct mutagenic action of ultraviolet rays.

3446 Smith, J. B.
**Detection of locus-mutagen interactions by the *Neurospora* back-mutation technique.**
Diss. Abstr. 1959 : **20** : LC Card Mic 59–2956 : p. 463. (Abst.).

Five auxotrophic mutants of *N. crassa* induced by $\beta$-propiolactone were each combined with a morphological variant to give auxotrophic colonial mutants and the effects of ultraviolet radiation, $\beta$-propiolactone, diepoxybutane and dimethyl sulphate on back mutation to prototrophy were determined. Of the two strains undergoing no spontaneous reversion, one responded only to dimethyl sulphate and the other only to ultraviolet rays. The remaining strains differed in quantitative response to the mutagens. "The possibility of suppressors has not been eliminated but adaptation did not appear to be involved, nor was competitive suppression ('Grigg effect')".

3447 Rapoport, I. A.
**(Right and left morphological asymmetry caused by optical isomers of emetine).**
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1960 : **130** : 1355–58. [Russian].

All the 219 *Drosophila* larvae reared on a nutrient substrate containing a sublethal dose of l-emetine were characterized by right-handed asymmetry, while most of those which had been reared on a solution containing d-emetine showed left-handed asymmetry. Genetical analyses of the asymmetrical insects suggest that the effect was not heritable.

3448 Chu, T.-M.
**(The expansion of Mičurinist genetics in China in the last ten years and its achievements).**
Nung-yeh-hsueh Pao (J. Agric.)/Act. agric. sin. 1959 : **10** : 330–43. [Chinese].

Breeding along Mičurinist lines in China is reviewed with special reference to field crops, fruit trees, vegetables, forest trees, microorganisms, silk worms and domestic animals. The techniques employed include vegetative hybridization, multiparental pollination, selective fertilization, and induced changes in vegetative period and resistance to frost, drought and salinity.

3449 Davis, R.
**Asexual selection in *Neurospora crassa*.**
Genetics 1959 : **44** : 1291–308.

An algebraic model is proposed for the determination of the selective values of different

conidial types under different nutritional conditions. When one of a pair of homocaryotypes is selected against, the selective value of the other can be calculated in terms of its contribution to the next generation in relation to the heterocaryotypic contribution.

## EVOLUTION

**Genetics and twentieth century Darwinism.**
Cold Spring Harbor symposia on quantitative biology 1959 : **24** : Pp. 321.

The participants of this symposium, held in commemoration of the centenary of the publication of the *Origin of Species*, were drawn from the fields of ecology, anthropology and paleontology as well from genetics. Contributions likely to be of most interest to plant breeders are abstracted below:—

3450 *Mayr, E. Where are we? (pp. 1–14).*
After outlining the development of genetics with reference to evolutionary theory and giving a short historical survey of the relationship between some concepts of genetics and those of other branches of biology, the author singles out for discussion some unsolved problems of natural selection in general and of evolution at the particular levels of the chromosome, individual phenotype, population, species and phyletic line. The general aspects of natural selection considered comprise: (1) the selection of genes *v.* the selection of phenotypes, (2) the measurement of fitness, (3) the population as a unit of selection and (4) reproductive success.

3451 *Dobzhansky, T. Evolution of genes and genes in evolution. (pp. 15–30).*
"Both the ontogenetic and the phylogenetic development of living organisms is epigenetic. Neither organs, nor body parts, nor characters, nor biochemical constituents of the adult organism are preformed in the gametes. The heredity is coded in the gametes by means of the 'genetic alphabet' consisting of only four 'letters', which are the four kinds of nucleotide pairs of the deoxyribose nucleic acids. Evolution may be viewed as a result of these 'letters' combining into new 'words'. The genetic code has become perfected in the course of organic evolution. The genes, which may be compared with 'words' in the genetic message, have probably become better integrated when gene recombination and sexual reproduction became firmly established. The prevalence of polygenic (isoallelic) mutations and of heterotic heterozygotes created the need for further integration of the genes into supergenes. The supergenes in a chromosome may perhaps be treated as being in some ways similar to multiple alleles."

3452 *Stubbe, H. Considerations on the genetical and evolutionary aspects of some mutants of Hordeum, Glycine, Lycopersicon and Antirrhinum. (pp. 31–40).*
With reference to published and unpublished investigations by the author and his colleagues at the Institut für Kulturpflanzenforschung [Institute for the Study of Cultivated Plants], Gatersleben, Germany, the author discusses the following problems: (1) the degree of identity between experimentally induced and natural forms within a species, (2) parallel mutations in wild and cultivated species and the evolutionary consequences of such changes, and (3) the evolutionary significance of macromutants possessing characters of taxonomical importance in adjacent genera. (1) An extensive morphological and taxonomical analysis of experimental mutants of *Hordeum vulgare* has indicated that practically no characters which are not already to be found in the world collection of barley varieties have appeared among the mutants. As reported from Gatersleben and by other investigators, mutants so far tested are genetically identical with the corresponding natural forms. It may be supposed that the natural diversity in the various characters is the outcome of mutation. Induced mutation is however considered to remain important from the point of view of practical breeding, since new alleles at already known loci may be produced, as in the case of *erectoides* mutants, while presumably still other loci may be induced to mutate for the first time. Study of induced mutants of the soya-bean variety Heimkraft I has revealed many cases of striking morphological resemblance to entries in the varietal collection, although tests of genetical identity have not yet been made. (2) Investigations on parallel mutations in (*a*) *Lycopersicon pimpinellifolium* and *L. esculentum* and (*b*) *H. agriocrithon, H. ischnatherum* and cultivated barley are in progress. Some early results are reported. Many mutants of *H. agriocrithon* and *H. ischnatherum* have been obtained which are phenotypically identical with induced mutants of cultivated barley. The mutants of the wild species show changes in the ears and glumes, leaf size and colour, growth habit and developmental rate. Genetical relationships between mutants of the wild and cultivated barleys have not yet been ascertained. The new forms include

a winter type derived from *H. ischnatherum* which ordinarily has a spring habit, and a variant of *H. agriocrithon* with a nonbrittle rachis. Among the 24 *L. pimpinellifolium* mutants so far crossed with corresponding mutants of *L. esculentum*, seven cases of genetical identity between the two species were detected. One mutant of *L. pimpinellifolium* had greatly enlarged leaves, similar to those of the cultivated tomato, while another had enlarged flowers and was almost equal to *L. esculentum* var. *cerasiforme* in the size of its fruits, which were multilocular, with reduced seed production. (3) The results of work on macromutation in *Antirrhinum* suggest that maintenance of such mutation is ensured by virtue of the variable manifestation of the character involved, such as stamen number in the mutants *transcendens* and *neohemiradialis* in *A. major*. Transferred by hybridization into a new idiotypical environment, the mutant characters may be stabilized under the influence of secondary genes.

3453 *Buzzati-Traverso, A. A. Quantitative traits, and polygenic systems in evolution.* (*pp. 41–46*).

The following problems are considered: (1) whether current mathematical theories applied in the study of population genetics provide adequate interpretation of the complexities of polygenic systems; (2) the influence of population size upon the outcome of selection affecting polygenic characters; (3) whether the rate of change in polygenic traits under natural selection is sufficiently high to account for the known speed of evolutionary events; and (4) measurement of the fitness of a population. In experiments on *Drosophila*, the author found that new constellations of homozygous polygenes became rapidly established which conferred a higher fitness upon the population. It is postulated that the selective advantage of heterozygotes for new mutations ensures rapid evolution in polygenic traits by providing a highly effective trigger mechanism whereby every mutation is offered the best chance of being tried out under selection, prior to the possible establishment of favourable homozygous polygenic combinations.

3454 *Morley, F. H. W. Natural selection and variation in plants.* (*pp. 47–56*).

Drawing upon examples taken from reported work dealing with agricultural plants, the author evaluates methods applied in the study of the action of natural selection. The material analysed is of two types: (1) races adapted to particular habitats and (2) populations, natural or artificial, in the process of becoming adapted to habitats to which they have not long been exposed. The survey of races is illustrated by (*a*) work on specific characters (cyanogenetic glycosides in *Trifolium repens*, embryo dormancy in *T. subterraneum* and flowering time and its components in the latter species), (*b*) transplant experiments and (*c*) investigations under controlled environments. The experimental population approach is discussed with reference to studies on barley mixtures, *T. subterraneum* and lead tolerance of grasses. The role of variability in adaptation is examined. In conclusion, suggestions are made as to ways in which the analysis of the action of natural selection may be rendered more stringent.

3455 *Carson, H. L. Genetic conditions which promote or retard the formation of species.* (*pp. 87–105*).

Largely with reference to the animal kingdom, the following hypothesis is presented. Genetic adjustment may be accomplished by positive selection for either (1) homozygosity for a given locus (homoselection) or (2) heterozygosity (heteroselection). Homoselection predominates in small, ecologically marginal populations of polytypic species, such populations being conducive to homoselection because they tend to be inbred and partially isolated and usually show relatively unrestricted genetic recombination. Aided by random drift, homoselection may lead to the fixation of genes conferring adaptation to specific ecological conditions and thus promotes speciation and subspeciation. Heteroselection results in the adjustment of the organism by the direct contribution of heterosis to fitness and is characteristic of large central populations of a species. Probably heteroselection initially consists of the exploitation of single genic differences associated with heterosis. Through recombination and selection, relationally balanced combinations of such genes may be developed. Devices such as inversion, translocation, polyploidy and parthenogenesis may then serve as a means of "capturing" these separate heteroses. Such devices have selective value in that they reduce the number of relatively unfit homozygotes produced, this reduction occurring if two or more heterotic loci are simultaneously captured. New inversions thus have an immediate value and will spread radially through a population. When heteroselection predominates, a species may respond to fairly drastic changes in its ecology, with relatively minor shifts in degrees of heterotic balance. It is suggested that weeds

and other cosmopolitan species become adjusted principally by heterotic buffering, since they show little evolution of special modes of adaptation, despite their wide distributions. If heterozygosity becomes fixed, as in balanced-lethal heterozygotes, high polyploids or apomicts, any further evolutionary change may be impossible.

3456 *Schwanitz, F. Selection and race formation in cultivated plants.* (*pp. 107–14*).

The author describes how amelioration of the environment by agriculture not only promotes the establishment of phenotypes which, if favourable conditions are maintained, have higher productive capacity than the more vigorous wild forms, but at the same time also reduces the effectiveness of natural selection. Numerous hereditary traits are preserved under initial domestication, which would not be maintained without the protection of man. Centres of primitive agriculture are thus centres of genetic diversity. Variability is very much reduced if cultivated plants, e.g. the tomato, escape from cultivation and become wild again. Human migrations have afforded further possibilities of increase in variability, through providing new conditions of natural and human selection and by affording opportunity for hybridization between species formerly separated. The impact of directed human selection upon the undirected initial variability constitutes the second main evolutionary step, which is characterized by diminution in the original diversity, progressively greater divergence from the ancient forms and separation of the initial gene pool into daughter pools. Local races adapted to increasingly specific human demands then arise independently within these daughter gene pools. The origin of cultivated plants may be regarded as a model for evolution under natural conditions. The author expresses the view that the study of evolution under domestication is at the present time a relatively neglected line of approach in the elucidation of problems of natural evolution.

3457 *Ehrendorfer, F. Differentiation-hybridization cycles and polyploidy in Achillea.* (*pp. 141–52*).

From a study of *Achillea* the following conclusions are reached concerning microevolution. Two major phases, differentiation and hybridization, underlie biotype formation, often alternating in a cyclic manner. At the diploid level, differentiation and establishment of barriers to crossing predominate, the result being the formation of a basic set of discontinuous races and species. The evolutionary cycle may be interrupted by partial or total restriction of the hybridization phase. At the polyploid level, however, genome recombination, due to breakdown of crossing barriers and consequent hybridization, predominates. A convergent and more or less continuous racial superstructure is thus established, the differentiation phase being restricted. The cytogenetical mechanisms associated with biotype formation differ correspondingly between diploids and polyploids. In diploids there is relatively strong expression of all genotypic changes, together with limited tolerance of larger deviations, while polyploids are characterized by a decisive buffering effect on all genotypic changes and an extended tolerance of larger deviations. Hybridization and polyploidization, as found in expanding or shifting races, tend to occur in biocenoses which are labile, occupy a more or less central ecological position, form part of a successional series, show relatively little or no interspecific competition and are often disturbed by human interference. Differentiation, as found mainly in races of diploids, in the form of ecological radiation, tends to adapt the populations to biocenoses with a marginal and more or less extreme position. Racial expansion, as found among variable polyploids, tends to occur in successional biocenoses, especially those leading towards the climax complex and in biotypes disturbed by human interference. Racial conservation, as found mainly in genetically depleted diploids, tends to occur in relic biocenoses which are more or less stable in composition and situation, have a largely marginal distribution and extra-successional status, show only a little or moderate degree of interspecific competition and are disturbed by little or no human interference.

3458 *Baker, H. G. Reproductive methods as factors in speciation in flowering plants.* (*pp. 177–91*).

Comments on criteria used by botanists in recognizing species and an analysis of the effects of different modes of reproduction upon population structure are followed by a discussion of speciation, with reference to (1) certain outbreeding systems, (2) wind and insect pollination, (3) length of the life cycle and permanence of the habitat, (4) the relation of outbreeding and inbreeding to polyploidization and (5) the role played by the breeding system in the establishment of species which are genetically isolated but not satisfactorily distinguishable on morphological grounds. The author next considers the apparently rapid speciation which

may accompany a change in breeding system, analysing the role of polyploidy and population structure. Finally, the evolution of species in apomictic groups is discussed. The general conclusion is reached that species cannot be delimited unless proper appreciation is given to the reproductive methods of the plants in question.

3459 *Wallace, B. Influence of genetic systems on geographical distribution.* (*pp. 193–204*).

Mayr has explained the existence of a species boundary which may be regarded as being dependent upon the disruption of gene complexes in marginal populations by assuming the occurrence of infiltration of genes from within the species boundary. With reference to plants and animals, one corollary of this hypothesis is examined: the cessation of gene flow should enable a species to extend its range. Examples are analysed which show that various means of minimizing selection for coadaptation between the gene pools of marginal populations on the one hand and the bulk of the species on the other do in fact have geographical distributions which conform with Mayr's hypothesis. The means discussed comprise self fertilization, parthenogenesis, extra chromosomes and chromosomal rearrangements. It is however pointed out that Mayr's hypothesis is not the sole way of interpreting these geographical distributions.

3460 *Smith-White, S. Cytological evolution in the Australian flora.* (*pp. 273–89*).

A survey of chromosome numbers in the major hardwood taxa representing the paleo-Australian flora, viz. the Myrtaceae, Rutaceae, Proteaceae, Epacridaceae and Casuarinaceae, provides evidence that their chromosome evolution has involved the origin of new basic numbers by either secondary polyploidy or secondary change without polyploidy. Where comparisons are possible, these taxa possess more diversity in basic number than related extra-Australian groups. Differences in basic number are generally characteristic of genera, while differences in both basic number and polyploidy are rare at the species level. The hardwood genera were established during the earlier part of the Tertiary. It is inferred that the stability in chromosome number which has been characteristic of all groups since mid-Tertiary was preceded by a period of relative instability. Since, broadly, the five unrelated families show the same pattern of cytological change, it is also assumed that instability was in part a consequence of the environmental conditions prevailing during late Cretaceous and early Tertiary. The paleo-Australian flora is notably poor in major taxa which may be characterized as herbaceous. In the Goodeniaceae, one of the more important endemic herbaceous families, polyploidy has a much higher incidence than in the hardwood families and is frequent even at subspecific levels. Nonendemic herbaceous genera which include endemic species possess either a high frequency of polyploids, e.g. *Danthonia*, or a series of secondary basic numbers, e.g. *Nicotiana* and *Lobelia*. In such genera, geographical patterns of cytological variation reflect the paths of entry and spread. Assuming that the origin of the angiosperms was extra-Australian, an attempt is made to relate the features of chromosome evolution to the wider problem of the evolution of the Australian flora. The hypothesis presented, which is based upon the genetical concepts developed by Mather and Wright, provides a broad framework into which the evolutionary patterns of individual groups can be fitted. In particular, the diversity in chromosome number among the woody paleo-Australian taxa is considered to be due to an episodic phase of diversification subsequent to the initial entry of angiosperms into the continent, probably in the mid-Cretaceous period.

3461 *Stebbins, G. L. The synthetic approach to problems of organic evolution.* (*pp. 305–11*).

In a concluding address, the author sums up the evolutionary hypotheses now generally agreed upon among biologists and expresses the view that these are remarkably similar to the theories of Darwin, except for their acceptance of the Mendelian basis of heredity. Many problems concerning the genetic basis of variability, the action of natural selection, the origin of species and major trends of evolution are then discussed and progress made towards their solution by contributions to the symposium is assessed.

3462 Lems, K.
**Botanical notes on the Canary Islands. II. The evolution of plant forms in the islands: *Aeonium*.**
Ecology 1960 : **41** : 1–17.

A case of adaptive radiation in plants is described. On the basis of studies of the range of distribution, morphology and ecology of the 32 species of *Aeonium* occurring in the Canary Islands, it is suggested that a shrubby ancestral population, believed to have reached the islands in early Tertiary times, has undergone natural

selection to give a series of shrubby, biennial and annual species of varied habit, each showing adaptation to the habitat in which it grows. The shrubby forms of the ancestral type are restricted to the humid coastal zone in loamy soil, while derived species are found in dry rubble, in crevices in the subalpine zone and in the cloud belt.

3463 Glass, B.
**Eighteenth-century concepts of the origin of species.**
Proc. Amer. phil. Soc. 1960 : **104** : 228–34.

Epigenetic and preformationist concepts and their bearing on eighteenth-century beliefs concerning the nature of the speciation are analysed.

3464 Kondratjuk, Je. M.
**(C. Darwin, the founder of the materialist theory of the evolution of the organic world).**
Ukrajin. bot. Ž. (Ukrain. J. Bot.) 1959 : **16** : No. 5 : 3–14. [Ukrainian].

An appreciative account of evolutionary theory, accepting Darwin's concepts of natural selection and intraspecific competition, is given. Soviet biologists who are thought to have promoted evolutionary studies include Mičurin and Lysenko.

3465 Kušner, H. F.
**(The founders of evolutionary theory. A scientific conference dedicated to the researches of J. Lamarck and C. Darwin).**
Priroda (Nature), Leningrad 1960 : No. 3 : 55–58. [Russian].

Darwinism and Lamarckism were discussed in relation to Mičurinism at a conference held in Moscow in November 1959. General remarks are made on achievements in plant and animal breeding by employing Mičurinist methods.

3466 Sytnyk, K. M.
**(The progress of Darwin's ideas in the USSR).**
Ukrajin. bot. Ž. (Ukrain. J. Bot.) 1959 : **16** : No. 5 : 15–27. [Ukrainian].

Russian evolutionary studies are surveyed and Mičurinism and Lysenkoism are discussed. The more generally accepted evolutionary theory is favoured in preference to Lysenko's theory of evolution by conversion. Whether intraspecific competition is operative in evolutionary processes, however, is left uncertain until more facts become available. The most important place in studies of evolutionary problems in Russia is given to V. L. Komarov's studies on the species problem in plants. Many other Russian biologists whose evolutionary studies are regarded as valuable are also named. The chromosome theory is criticized along Mičurinist lines.

3467 Dimitrov, P.
**(An important anniversary).**
Selskostopan. Misăl 1959 : No. 4 : 312–16. [Bulgarian].

Darwinism is discussed in relation to Lamarckism and Mičurinism on the occasion of the 150th anniversary of the birth of Darwin.

3468 Clausen, J. & Hiesey, W. M.
**The balance between coherence and variation in evolution.**
Proc. nat. Acad. Sci. USA 1960 : **46** : 494–506.

The following conclusions are reached. (1) The evidence available from experiments on the inheritance of ecological races in *Potentilla* and other genera indicates that in general the survivors throughout geological periods have been those kinds of organisms possessing a fair degree of inherited coherence balanced against potentials of variation that can be made available through interracial crossing. (2) As a result of their dynamic coherence-variation balances, natural entities remain unchanged so long as the environments remain essentially the same. Major changes in the environments cause migrations of races, interracial crossings, release of variability and changed selective pressures. These events can lead to establishment of new races adjusted to new environments. Certain species have nevertheless been able to retain their basic coherence mechanism relatively unchanged throughout geological periods, as has been demonstrated, for example, in the chromosomal homology of hybrids between the Old World and New World planes of the genus *Platanus*. (3) Once an equilibrium between coherence and variation has become established, adjustment occurs at all levels of differentiation, ranging from the local population to the ecological races, the species and higher categories. (4) The restraints of coherence become stronger as evolution proceeds towards entities of higher order.

3469 Poljanskij, Ju. I.
**[Darwinism and the problems of cytology. (On the occasion of the centenary of the publication of "The origin of species" by Charles Darwin)].**
Citologija (Cytology) 1959 : **1** : 477–85. [Russian].

An analysis is presented of the influence that

Darwin's evolutionary principles have exerted on various branches of biological science, including histology and cytology. Among the examples cited are the similarities of structure and behaviour in widely diverse organisms as revealed by the electron microscope and other modern techniques. Chromosome studies have also contributed towards the elucidation of phylogenetic relationships in many species and genera.

3470 Blagoveščenskij, A. V.
**(Biochemical evolution of the angiosperms).**
Bot. Ž. (Bot. J.), Moskva 1960 : **45** : 480–91.

Figures presented show that members of the Leguminosae held to be phylogenetically old contain a higher proportion of legumin, the molecular weight of which is 331,000, than of vicilin, the molecular weight of which is only 186,000. Relatively young members such as *Acacia, Phaseolus, Trifolium* and *Lupinus*, as well as *Dolichos lablab, Medicago sativa* and *Pisum sativum*, on the other hand, have a preponderance of proteins of low molecular weight. Similarly in the Gramineae, maize, an ancient genus, contains 68·91% of insoluble proteins and the recent hybrids of *Triticum* x *Agropyron* only 38·33%. It is also shown that enzymes such as catalase are more active in relatively young species such as *Magnolia grandiflora, Albizzia julibrissin* and *Medicago tianshanica* than in ancient species such as *Asimina triloba* and *Lathyrus pratensis*.
The situation described is taken as supporting the view that evolution proceeds in the direction of increased entropy. The view is further expressed that changes in the arrangement of the peptide chains in the synthesis of the proteins in the younger members of a series may provide the hereditary variation on which natural selection may act. Data are cited showing that growing certain varieties of wheat, cotton and eucalyptus under extreme conditions of environment leads to an increase in the activity of their catalase system.

3471 Erdtman, G.
**Pollen walls and angiosperm phylogeny.**
Bot. Notiser 1960 : **113** : 41–45.

In monocotyledons and monocotyledonoid dicotyledons, referred to as group A, the pollen grains are usually anatreme or zonotreme with transverse colpi; the apertures are simple. In the typical dicotyledons (group B), the grains are either zonotreme or pantotreme and the apertures are simple or composite. Transitional forms occur in the Magnoliales, Ranales and Piperales and have been identified from Late Senonian beds. In group B, apertures may be primitive in type, varying in both size and shape, or they may be of a type regarded as advanced, with a reduction or increase in aperture number. Differences between families in the stratification of the exine have been detected. It is concluded that studies of pollen morphology may be useful in taxonomic and phylogenetic investigations.

3472 Stauffer, R. C.
**Ecology in the long manuscript version of Darwin's *Origin of species* and Linnaeus' *Oeconomy of nature*.**
Proc. Amer. phil. Soc. 1960 : **104** : 235–41.

The author examines Darwin's ecological views, the relation of these views to his theory of evolution and their probable sources in Darwin's observations and reading.

3473 Oparin, A. I.
**Origin and development of life on earth.**
Sci. & Cult. 1959 : **25** : 23–29.

The author recapitulates his views on the origin of life with special emphasis on the selection of coacervate systems [cf. XXVIII, 3563].

3474 Keosian, J.
**On the origin of life.**
Science 1960 : **131** : 479–82.

Reasons are set out in support of the hypothesis that spontaneous generation of life is a recurrent phenomenon. The biochemical similarities of all organisms are attributed to selection of biochemical systems with common metabolic aspects rather than to a unique origin of life. Previous "disproofs" of spontaneous generation are thought merely to reflect an inadequate experimental approach. It is also thought that some of the major taxonomic discontinuities may be consequences of a polyphyletic origin of life.

3475 Sharma, A. K. & Sharma, A.
**Chromosomal alterations in relation to speciation.**
Bot. Rev. 1959 : **25** : 514–44.

Literature relevant to the role of chromosomal changes in speciation in plants is surveyed, with reference to (1) types of alteration involved, (2) diminution in chromatin as an indication of structural changes, (3) caryotypic differentiation of strains of crop species, (4) fragmentation, (5) the possible course of evolution of chromosome structure in the plant kingdom and (6)

variability in chromosome complements in the somatic tissue of entirely or partly vegetatively propagated plants. In conclusion, fundamental cytological problems requiring to be explored are indicated. The bibliography contains 194 references.

3476 Dyssa, F. M., Nesterenko, P. G., Stovas, M. V. & Širokov, A. Z.
**(The question of the causes of extinction of large groups of organisms).**
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1960 : **131** : 185–87. [Russian].
While not excluding other explanations of the causes of mass extinction of plants and animals in past geological periods, the writers put forward the hypothesis that increased radioactivity following volcanic eruptions was probably an important cause. Large quantities of radioactive elements have been found in the red-clay sediments at the bottom of the sea and in the lava deposits from volcanic eruptions in recent and past times. It is thought, therefore, that, in periods of intense volcanic activity, the atmosphere and sea became polluted by ionizing radiation and that the continued effects of radioactive elements may have produced harmful genetic effects upon plants and animals resulting in sterility and death.

## CYTOLOGY

3477 Funabiki, K.
**(A simple and reliable squash method using acetoorcein).**
Senshokutai (Chromosome)/Kromosomo 1959 : **41** : 1405–08. [Japanese].
The technique involves staining in 4·5% acetoorcein, squashing in 1% acetoorcein and mounting in Cutex nail varnish.

3478 Sirlin, J. L.
**The nucleolus problem.**
Nature, Lond. 1960 : **186** : 275–77.
The author gives a general discussion of the origin and behaviour of the nucleolus, within the framework of two interpretations: (1) the nucleolus represents one genetic site or a very few closely situated sites, the product of which is the nucleolar RNA, and (2) the nucleolus, apart from consisting of nucleolar RNA, is also largely an assembly point for different non-nucleolar ribonucleic acids assumed to originate at different genetic loci. Favouring (2), he draws attention to the possible role of the nucleolus in the genetic control of cytoplasmic syntheses and to the need of investigation of the relation of nucleolar ribonucleic acids to other cell ribonucleic acids.

3479 Martin, P. G.
**Differentiation of the nuclei of pollen grains.**
Heredity 1960 : **14** : 125–32.
Using a fast green staining procedure thought to be specific for basic proteins, the nucleoli in the pollen grains of maize and *Agave attenuata* stained, whereas those in the root tips of maize and *Allium cepa* did not. Unequal amounts of the stain were present in the nucleoli of the generative and vegetative nuclei after the first pollen mitosis in maize and *A. attenuata*. The sum of the amounts in the postmitotic nucleoli of the pollen did not differ from the amount in the premitotic nucleoli. It was therefore concluded that the basic protein of the premitotic nucleolus was distributed unequally but without loss between the nucleoli of the vegetative and generative nuclei. This unequal distribution may be important in the differentiation of the nuclei of pollen grains.

3480 Plaut, W.
**The effect of tritium on the interpretation of autoradiographic studies on chromosomes.**
Lab. Invest. 1959 : **8** : 286–95.
With particular reference to the conflicting evidence produced by Plaut and Mazia [cf. XXVI, 1978] and by Taylor, Woods and Hughes [cf. XXVII, 2508], it is argued that chromosomes treated with tritium-labelled thymidine have a much higher potential for self-modification, if not self-destruction, than chromosomes treated with $C^{14}$-thymidine. It is suggested that, in autoradiographic studies where short range $\beta$ particle emitting substances such as tritium are used, it is possible that high resolution is obtained at the cost of structural modifications which are not easily detected, and "that we are analysing the effect of tritium beta particles rather than the normal behaviour of the structural units."
In the discussion that followed, Taylor argued that, since there is twice as much radioactive material in the chromosomes in the first interphase as in the second, then, on the basis of radiation damage, there should be twice as many sister-chromatid exchanges in the first division as in the second, if such exchanges are produced by the radiation. In fact, the numbers of exchanges in the first and second divisions are essentially equal, which indicates that the

radiation could not be producing this type of exchange to any significant extent.

3481 Kato, Y.
**(On diversity in chromosome number within the individual organism. The situation in plants).**
Senshokutai (Chromosome)/Kromosomo 1960 : **35** : 1447–58. [Japanese].
A review of recent literature on the above topic is presented.

3482 Grigg, G. W.
**Phenotypic lag in *Neurospora*.**
Heredity 1960 : **14** : 207–10.
Germination of $h^+$ microconidia from $h^+$–$h$ heterocaryons was lower on a minimal than a histidine-supplemented medium. It may be assumed that some factors were entirely lacking or present in a low concentration in the cytoplasm of the newly formed microconidium and that, to initiate synthesis of these factors by $h^+$ nuclei, histidine must be supplied. This assumption implies that "somewhere along the synthetic pathway of the histidine factors there occurs an unbalanced or an irreversible reaction."

3483 Tschermak-Woess, E.
Die innere Chromosomenvervielfachung —pflanzliche Riesenchromosomen— andere bemerkenswerte Kernstrukturen.
**(Internal chromosome multiplication—giant chromosomes in plants —other notable nuclear structures).**
Umschau 1959 : **59** : 434–36.
Endopolyploidy has been observed in the root tissues of 178 out of 212 species of flowering plants examined and in the stem tissues of 50 out of 62; the condition has also been seen in leaves, fruits and hairs and is particularly frequent in glandular or secretory tissues. The occurrence of giant chromosomes in the endosperm haustoria of young seeds is also described. [Cf. XXVII, 3708 and XXVIII, 71].

3484 Neary, G. J., Evans, H. J. & Tonkinson, S. M.
**A quantitative determination of the mitotic delay induced by gamma radiation in broad bean root meristems.**
J. Genet. 1959 : **56** : 363–94.
A method is described for measuring the mitotic delay caused by radiation in meristematic cells at any particular stage of mitosis. Some of the principles of the method, which depends upon the use of colchicine to determine the mitotic rate, have been explained in an earlier paper [XXVIII, 3762]. After doses of 53 or 97 rads of $\gamma$ radiation from $Co^{60}$ given in 5·0 min., the usual pattern of decrease in the mitotic index followed after several hours by an increase was observed in roots of *Vicia faba*. The amount of delay of a cell in reaching mitosis was roughly proportional to dose of radiation. In general, the further interphase cells were from the next mitosis at the time of irradiation the greater was the delay. In the case of interphase cells at the stage of DNA synthesis, however, the delay was constant throughout this stage. Cells irradiated when already in prophase completed mitosis with only slight disturbance. With 53 rads, no prophase cells were delayed and late-prophase cells even underwent acceleration of mitosis. With 97 rads, only cells at early prophase were delayed, but by not more than half an hour. Both doses induced a temporary blockage in cells which were at the end of interphase, so that none of these cells reached metaphase earlier than 2 hr. after irradiation, the normal time for prophase being $1\frac{1}{2}$ hr. In addition to delaying the entry of cells into mitosis, irradiation also caused the cells to undergo mitosis more slowly than normal. This slowing down and the preceding delay had a fairly close correlation. It is therefore suggested that delay is due to a general retardation in cell development, rather than solely to temporary blockage. The finding that no true chromatid aberrations appeared at metaphase until 2 hr. after irradiation, together with the observations on mitotic delay, implied that such aberrations are only induced in cells receiving radiation prior to prophase. Two appendices are provided, one dealing with quantitative details of the action of colchicine and the other with the analysis of exponentially increasing cell populations.

3485 Bergmann, L.
**Growth and division of single cells of higher plants *in vitro*.**
J. gen. Physiol. 1960 : **43** : 841–51.
The culture of single cells of *Nicotiana tabacum* and *Phaseolus vulgaris* on White's agar medium supplemented with coconut milk and 2,4-dichlorphenoxyacetic acid is described. The single cells were isolated from suspensions derived from stem-callus tissue. About 20% of the cells underwent repeated division. Tissue clones could therefore be isolated and maintained as growing cultures. It was possible to follow the course of the divisions under the

microscope. Possible applications of the technique in genetic and other studies are discussed.

3486 Mitra, J., Mapes, M. O. & Steward, F. C.
**Growth and organized development of cultured cells. IV. The behavior of the nucleus.**
Amer. J. Bot. 1960 : **47** : 357–68.
The nuclei and chromosomes of carrot cells were examined during the growth of the following sequence of cultures: (1) secondary phloem from a storage root, (2) cells derived from (1) freely suspended in a liquid medium and (3) plants eventually secured from (2). Cells in (1) and in roots of plantlets grown from (2) were diploid. Meiosis was normal in a plant brought to flower after it had been raised from a cell suspension. Free-cell cultures, however, showed considerable diversity of aberrations, polyploidy, haploidy, dicentric bridges and even tricentric bridges being among the features observed.

3487 Davidson, D.
**A method for estimating mitotic rates in *Vicia* roots after X irradiation.**
Brit. J. Radiol. 1959 : **32** : 612–14.
It was found that after X irradiation with 600 r. there is a period of reorganization in the root meristem and that during this period some cells undergo a number of rapid divisions. The dividing cells may include some marked with chromosome rearrangements and these may be used to estimate the mitotic rate; it was found that divisions may occur once every 24 hr., whereas Gray and Scholes estimated that divisions occur once every $3\frac{1}{2}$ days after irradiation. Cells with new chromosome complements are sometimes included in the reorganized meristem.

3488 Sharma, A. K. & Datta, A.
**Effect of riboflavin on plant nuclei.**
Genet. iber. 1959 : **11** : 129–38.
Treatment of *Allium cepa* roots with riboflavin in concentrations of 0·006 M to 0·025 M induced mitotic division in resting polyploid cells and reduction division in some diploid cells. In earlier work, the same effect produced by nucleic acid treatment was regarded as the result of supplementing a deficiency in the polyploid nuclei and of causing an excess in the diploid cells [XXV, 2697]. According to this interpretation the present results suggest that riboflavin increases nucleic acid synthesis.

3489 Kosan, J. H. D.
**Culture of excised anthers of *Lilium longiflorum* (Part 1). Incorporation of tritiated cytidine in excised anthers of *Lilium longiflorum*, (Part II).**
Diss. Abstr. 1959 : **20** : LC Card Mic 59–2583 : p. 468. (Abst.).
Microsporocytes at late leptotene - early zygotene or later stages at the time of anther excision regularly completed meiosis when cultured by means of a basic mineral medium supplemented by various substances. Cells at earlier stages usually failed to complete meiosis. Buds were allowed to be in contact with labelled cytidine for 20 hr., the microsporocytes being at the premeiotic to zygotene stages when the anthers were excised. Autoradiographic analysis showed that, at the beginning of culture after the treatment, DNA was present only in preleptotene cells. After several days of culture, DNA was detected in cells in anthers which contained microsporocytes at premeiosis at the beginning of culture. A pool of soluble precursors probably provided the necessary metabolites for this delayed labelling. Observations at the beginning of culture indicated that very little RNA was incorporated into the cytoplasm during leptotene to zygotene. The cytoplasmic metabolism in PMCs is therefore probably more or less completed by the time late leptotene - early zygotene is reached. In the tapetum, DNA was detected in some nuclei in premeiotic material at the beginning of culture, while all zygotene nuclei were well labelled. All anthers contained RNA in the tapetum at the beginning of culture. The breakdown of the tapetum *in vitro* was associated with decreased amounts of nucleic acids; these could no longer be detected when breakdown was complete.

3490 Samorodova-Bianki, G. B.
**(Microsporogenesis and carotenoids).**
Fiz. Rasten. (Phys. Pl.) 1959 : **6** : 99–102. [Russian].
In studies of carotenoid metabolism in the anthers of *Lilium regale* and *L. henryi* and representatives of nine other orders at the Institute of Plant Industry, it was found that reduction in carotenoids occurred at metaphase I and at the time of formation of dyads or triads. The reduction in the amounts of carotenoids was followed by an increase after the microspores were formed.

3491 Longwell, A. & Mota, M.
**The distribution of cellular matter during meiosis.**
Endeavour 1960 : **19** : 100–07.
Using the interference microscope, the various

regions of the cell are investigated by means of the colour differences they show in unstained preparations. Meiosis was studied in the microsporocytes of *Triticum aestivum*, *Zea mays* and *Tradescantia paludosa*, and in grasshopper spermatocytes.

3492 Battaglia, E.
Mutazioni cromosomiche e formule relative. (**Chromosome mutations and their formulae**).
Caryologia 1958 : **11** : 259–60.

It is proposed that variants arising from chromosomal mutations should be indicated by the formula (mut.); thus a 15-chromosome mutant of a 16-chromosome original would be $2n$ (mut.) = 15. The genomic composition may also be indicated, thus $2n$ (mut.) $= x + x_3 = 16$ or $2n$ (mut.) $= x + x_4 = 8 + 7 = 15$.

3493 Jain, H. K. & Bose, A. K.
**Experimentally induced interbivalent redistribution of chiasmata in *Delphinium*.**
Nature, Lond. 1960 : **186** : 260–61.

Observations on plants of *D. ajacis* ($2n = 16$) from X-irradiated seeds showed that, as the frequency of ring bivalents produced by the two pairs of large chromosomes decreased as the result of the formation of univalents or rod bivalents instead, the frequency of ring bivalents among the six pairs of smaller chromosomes exceeded the frequency of such configurations in the control material or was maintained at a similar level, although a number of the smaller chromosomes also appeared as univalents. It may be supposed that irradiation induced structural changes in a number of chromosomes at random, affecting pairing and chiasma formation. The nonrandom redistribution of chiasmata detected is indicative of coordination in the control of chiasma formation. The results also point to the possibility that spontaneous structural changes in chromosomes may release latent variability through redistribution of sites of crossing over.

3494 Mühling, G. N., Hof, J. V., Wilson, G. B. & Grigsby, B. H.
**Cytological effects of herbicidal substituted phenols.**
Weeds 1960 : **8** : 173–81.

All the substituted phenols tested caused c-mitotic configurations and inhibition of onset of cell division in root tips of *Pisum sativum* 'Alaska'. Treatment with some of the substances also resulted in an increase of over-contracted late prophase configurations superficially resembling those induced by the prophase poison actidione. The c-mitotic index was measured by assigning values of zero to normal configurations after prophase (prometaphase, metaphase, anaphase and telophase), 1 to "scatters" and 2 to "clumps". The fact that a full c-effect was not observed may be explained partially by the strong tendency to revert to normal when the dose was not quickly lethal. Only 2,4,6-trichlorophenoxyacetic acid induced a significant degree of recoverable polyploidy, this being the only compound with a fairly high c-index.

3495 Rieger, R. & Michaelis, A.
Chromosomenaberrationen nach Einwirkung von Acetaldehyd auf Primärwurzeln von *Vicia faba*. (**Chromosome aberrations after treatment of primary roots of *V. faba* with acetaldehyde**).
Biol. Zbl. 1960 : **79** : 1–5.

Radiomimetic effects have previously been shown to be induced by ethyl alcohol [cf. 96], which is a reduction product of acetaldehyde in anaerobic respiration. In the present work, 24 hr. treatment with $5 \times 10^{-3}$ to $5 \times 10^{-2}$ Mol. acetaldehyde induced isolocus breaks, chromatid translocations, duplication deficiencies, deletions, triradials and a few free chromatid breaks in primary roots of *V. faba*. All reunions were on a chromatid basis and aberrations occurred preferentially in the heterochromatic segments. The agent was active over the temperature range 0–30° C., with an optimum of 12° C., unlike ethyl alcohol, which increases in activity with rising temperature up to 30° C. It is concluded that acetaldehyde plays little part in inducing the aberrations observed under anaerobic conditions [cf. 94], since these rarely appear below 18° C.

3496 Tanifuji, S.
(**The effects of streptomycin on the pollen mother cells of *Paris hexaphylla*).**
Senshokutai (Chromosome)/Kromosomo 1960 : **35** : 1429–43. [Japanese].

After treatment with 125 to 500 p.p.m. of dihydrostreptomycin sulphate for 1–12 hr., the following were among the cytological effects observed: chromosome stickiness and contraction, lagging univalents, tripolar spindles, and chromosome, chromatid and "chiasma" breakage.

3497 Rieger, R. & Michaelis, A.
Versuche zur Auslösung von Chromosomenmutationen mit Cadaverin- und Putrescin-hydrochlorid bei *Vicia faba.* **(Experiments on the induction of chromosome mutations with cadaverine and putrescine hydrochlorides in *V. faba*).**
Mber. dtsch. Akad. Wiss. Berlin 1959 : **1** : 51–53.
Neither putrescine hydrochloride nor cadaverine hydrochloride were found to have any mutagenic action on roots of *V. faba* whereas Marquardt had found that putrescine hydrochloride induced mutations in inflorescences of *Oenothera* [cf. XX, 732]. It is suggested that *Vicia* roots are able to decompose the amines by means of diaminooxidase.

3498 Jackson, R. C.
**Supernumerary chromosomes in *Haplopappus gracilis.***
Evolution, NY 1960 : **14** : p. 135.
In a further examination of *H. gracilis*, a species previously reported as having $n = 2$ [cf. XXVIII, 1193], plants with $n = 2$, $2 + 1$, 3 and $3 + 1$ were found. Identical in appearance, the supernumeraries were associated with certain morphological characters. Two possible modes of origin of the supernumeraries are suggested: (1) extra chromosomes may have been introduced into the species as the result of introgression by another having a higher chromosome number, or (2) the extra chromosomes represent the centromeres and adjacent chromatin remaining after the aneuploid reduction in chromosome number which may have given rise to *H. gracilis.*

**Biological replication.**
New Biol. 1960 : No. 31 : Pp. 156.

3499 *Abercrombie, M. Introduction to replication.* (*pp. 10–24*).
This general introduction deals with the biological significance of replication, self-replicating cycles, the role of DNA in replication, and inexact copying.

3500 *Brachet, J. The control of protein synthesis.* (*pp. 25–38*).
The evidence is considered for the theory that protein synthesis is brought about by microsomal RNA templates which have incorporated soluble RNAs specific for each kind of amino-acid.

3501 *Symonds, N. D. The structure and replication of DNA.* (*pp. 39–56*).
An account is given of the work that led up to the Watson-Crick model for the structure of DNA and of subsequent attempts to explain how such a molecule might be replicated.

3502 *Penrose, L. S. Developments in the theory of self-replication.* (*pp. 57–66*).
The light thrown on biological replication by self-replicating mechanical models [cf. XXIX, 2260] is further discussed and suggestions are made as to how phosphate groups may play a major role in the replication of DNA and RNA.

3503 *Burton, K. Replication in bacteria and viruses.* (*pp. 67–85*).
The following topics are briefly reviewed: sexual recombination and F strains in bacteria, bacterial transformation, RNA and protein synthesis, the developmental cycle of bacteriophages and the nucleic acids of bacteriophages.

3504 *Newth, D. R. Replication during embryogenesis.* (*pp. 86–95*).
The relative roles of nuclear DNA, cytoplasmic organization and environment in determining the course of embryological and later development are considered, also the question as to how far nuclear information "merely modifies a pattern of life whose essential features are substantially independent of it."

3505 *Humphrey, J. H. Antibody formation.* (*pp. 96–106*).
A brief review is given of recent work on the mechanism of formation of antibodies and of theories, such as (1) the selection of hypermutable mesenchymal cells forming specific antibodies and (2) the induction by antigens of specific RNA templates.

3506 *Beale, G. H. Paramecium and the problem of differentiation.* (*pp. 107–16*).
Two types of differentiation have been demonstrated in *Paramecium*: (1) varying expression of genes according to cytoplasmic environment, as in the antigen system; and (2) a specific effect of uncertain nature on the early stages of macronuclear development, as in the mating-type system.

3507 *Pirie, N. W. Biological replication considered in the general context of scientific illusion.* (*pp. 117–35*).
A critical study is made of the assumptions underlying current views on biological replication, virus synthesis, the role of nucleic acids as carriers of genetic information and the use of isotopes as markers.

3508 Kolomiec, P. T.
**(Crossing self pollinators without emasculating the maternal flowers).**
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1959 : No. 3 : 68–69. [Russian].

A fair proportion of hybrids was obtained by intervarietal hybridization without emasculating the maternal flowers in such plants as wheat and peas in experiments conducted at Moscow University in 1953–4. The proportion of hybrids to the number of flowers pollinated by foreign pollen was 46·7% in soft spring wheats and 75–96% in peas. The method was also found to be effective for production of intergeneric hybrids of wheat ♀ x rye ♂.

3509 Gress, M.
Der Einfluss des Plasmas und einer geringen Änderung des Genoms auf die Affinität zwischen Samenanlagen und Pollenschläuchen bei *Oenothera odorata.*
**(The influence of the cytoplasm and a slight alteration of the genome upon the affinity between ovules and pollen tubes in *Oe. odorata*).**
Biol. Zbl. 1959 : **78** : 871–88.

*Oe. odorata* plants with the genotypes v.I, v.$I_T$ and v.$I_{Ri}$ were used as females in crosses with the trisomic mutant type A, which allows only the v complex to be transmitted through the pollen. The affinity was greater between I ovules and v pollen tubes than between v ovules and v pollen tubes.
The degrees of affinity were affected by the type of cytoplasm carried by the parents, i.e. whether *odorata* or *berteriana*; also the factors *T* and *Ri* altered the v–v affinity when the female had *odorata* cytoplasm and changed both the v–v and the I–v affinity when the female had *berteriana* cytoplasm.

3510 Konarev, V. G.
**(A scientific conference on nucleic acids in plants).**
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) : Ser. Biol. 1959 : No. 4 : 631–34. [Russian].

A report on a conference held at Ufa in November 1958, together with the titles of 35 papers and the names of their authors, is presented. The subjects discussed were: (1) the nature and biological role of nucleic acids; (2) methods of investigating nucleic acids in plants; (3) the role of nucleic acids in development; and (4) the effect of external conditions upon nucleic-acid metabolism and morphogenesis in plants.

3511 Woods, P. S. & Taylor, J. H.
**Studies of ribonucleic acid metabolism with tritium-labeled cytidine.**
Lab. Invest. 1959 : **8** : 309–18.

In *Vicia faba* roots which were treated for one hour with $H^3$ cytidine, the incorporation of the labelled precursor took place mainly in the nucleolus. In prophase nuclei, active incorporation continued in the nucleoli, while in prometaphase nuclei, when the nucleoli had just disappeared, labelled nucleolar material was still associated with the chromosomes. This association did not continue long, however, and metaphase and anaphase chromosomes were not labelled.
When treatment was continued for 8 hr. the concentration of labelled RNA within the nucleolus was found to rise rapidly during the first 1½ hr. of treatment, after which no further increase was recorded. No radioactive material was found in the cytoplasm during the first hour, but soon afterwards a marked increase was recorded, and the amount continued to rise. In material treated for 1 hr. with $H^3$ cytidine and then allowed to grow for 5 hr. in a non-labelled medium, the nucleolar contents were not labelled while the cytoplasm was moderately labelled. The hypothesis is presented that small RNA molecules might first be assembled in close proximity to the DNA of the chromosomes, before passing immediately to the nucleolus to be modified and perhaps linked with protein. This latter step would require more time for completion than the first step. Finally the large RNA-protein units would move to the cytoplasm where they would be available to take part in protein synthesis.

3512 Tupý, J.
**Callose formation in pollen tubes and incompatibility.**
Biol. Plant., Praha 1959 : **1** : 192–98.

Callose formation in pollen tubes of the self-incompatible apple Lord Lambourne was much greater after self pollination than after pollination by the variety Golden Pearmain. There appears to be an inverse relation between growth rate of pollen tubes and intensity of callose formation. Similar results were obtained with self-sterile *Nicotiana alata.* It is suggested that the rate of accumulation of callose in pollen tubes may be used as a measure of compatibility in apple.
Resorcin blue was found to be a good stain for pollen tubes within stylar tissue.

3513 Münzner, R.
Untersuchungen zur Physiologie von Pollenkeimung und Schlauchwachstum unter besonderer Berücksichtigung der Borsäurewirkung. (**Investigations on the physiology of pollen germination and tube growth, with special reference to the effect of boric acid**).
Biol. Zbl. 1960 : **79** : 59–84.

A concentration of 0·01 or 0·001% boric acid was found to have a stimulating effect on pollen-tube growth and generally also on pollen germination in more than 60 angiosperm species. Boric acid also stimulated pollen tube growth in gymnosperms. Electron-microscope studies of pollen-tube walls from boron-containing and boron-free cultures suggested that boric acid affects wall formation.

3514 *Juzepčuk, S. V.
(**The Komarov conception of the species, its historical development and expression in the "Flora of the USSR).**"
(The species problem in botany). Akad. Nauk SSSR, Bot. Inst. V. L. Komarova, Moskva-Leningrad : 1958 : **1** : 130–204. [Russian].

Contributors to the Flora of the USSR, which is nearing completion under the editorship of V. L. Komarov, have been instructed to follow the concept of the species developed by Komarov; though the extent to which this directive has been followed varies with the different contributors, the principle is considered to be important for the science of plant taxonomy and is here explained, some critics of the principle being answered in the process.
It is emphasized that in the Linnaean view the species was monotypic and in those cases where further evidence has shown them to be composite they have been broken down into two or more distinct species, without recourse to subspecies. This is the principle that Komarov has attempted to maintain. Related species are arranged together in series, very much in the way previously adopted by Kerner and Wettstein. The basic unit in Komarov's system was the race, which he defined as follows: "a homogeneous group of individuals connected by a common tribal life, community of physiological processes and morphological features, the same genetic process and great hereditary stability". Thus his race is essentially a physiological and geographical concept; cross fertilization may occur between the individuals constituting a race but since each race is confined to a distinct geographical area crossing does not take place between races, and they are thus genetically distinct. Hence in a given area there may be many species of a given genus but rarely more than one race. The race receives the Latin binomial and the arrangement of the species into series was done on phylogenetic considerations, which are inevitably to a certain extent subjective.
The author defends the inevitably large number of species that the consistent application of Komarov's principles create when applied to most genera. Our task, he submits, is to see nature as it is and not as we would have it be. The result is that we are presented with a spate of Latin epithets for races of what were once familiar species; thus in place of *Triticum dicoccum* we have *T. volgense*, *T. armeniacum* and so on. It is nevertheless claimed that systematists working for instance with apomictic plants have come to the unanimous conclusion that "only a binomial system of nomenclature applied to every apomictic form is the rational method of research".

## CROP PLANTS

3515 Station Centrale de Génétique et d'Amélioration des Plantes. Rapport d'activité pour les années 1957 et 1958. (**Central Station of Genetics and Plant Breeding. Report of activities for the years 1957 and 1958**). **1** : Pp. 123; **2** : Pp. 52. (Mimeographed).

**Wheat.** Three selections, P342–4, B21–1–10 and 81–12, are resistant to yellow rust and stem rust race 21. P342–4 is similar to Étoile de Choisy but less susceptible to *Septoria* (*Leptosphaeria*) *nodorum* and *Cercosporella herpotrichoides*; it is cold resistant but susceptible to lodging. B21–1–10 is said to be particularly resistant to cold. Line 81–12 is a dwarf variety, very resistant to cold, which matures at the same time as Cappelle-Desprez and is highly resistant to lodging and to *C. herpotrichoides*. Carest has been included in the official list of approved varieties. Bred for the eastern region of France, it is said to be resistant to *Tilletia foetida*, cold and stem rust.
**Oats.** A new black-grained winter oat, Hiverna, has been added to the official collection. It is earlier than Avoine du Prieuré [Priory oat] with

* An extended summary of this paper is on file at the Bureau.

comparable lodging resistance although its cold resistance and productivity are slightly lower. Resistance to crown rust in Bonham was found to be conditioned by two complementary genes. $R_1$ alone, when homozygous, confers high resistance, while $R_2$ is less effective. The high yield of this variety and also of Garry is at least partly due to their high resistance to crown rust.

**Maize.** Austrian, Hungarian and Yugoslavian varieties were included in hybridization trials with local lines, and their progenies are now under observation. Breeding for cold resistance was continued.

**Barley.** Atlas and Frimas which are very resistant to cold yielded well in 1957 and 1958 but less than Bordia. Atlas however is more resistant to lodging than Bordia. A severe attack of *Rhynchosporium* in 1958 showed Atlas to be susceptible.
From Rika x 142 and (Bordia x Kenia)84 x Piroline a number of promising lines were developed which have easily outyielded Rika and Piroline. Some promising lines have also been bred from Irma x Rika and Bk84 [(Bordia x Kenia)84] x Frisia.

**Forage plants.** Trials of lucerne, vetch, fodder peas, cocksfoot, perennial and Italian ryegrass, meadow fescue and timothy grass were continued. A winter-vetch variety developed at the station and named Myrto has been added to the official list. It is recommended for growing in wheat/vetch mixtures where the wheat has the same earliness as Cappelle. Yield trials of various wheat/vetch mixtures are reported.
A study of the inheritance of albinism in *Festuca pratensis* and *F. arundinacea* is being undertaken.

**Flax.** Wiera Selection 2 and line 51–4 (derived from Île de France x Wiera) are high-yielding, lodging-resistant lines. Selection for cold resistance has begun. Attempts will be made to transfer the cold resistance of *L. alpinum* and *L. tenuifolium* to winter flax varieties.

**Sugar beet.** Breeding for resistance to *Cercospora* was continued and yield trials of resistant varieties and hybrids are reported. The monogerm male-sterile strain 91MS of United States origin proved to be unstable for either character under local conditions. Yield and quality trials of diploid, triploid and tetraploid lines are reported.

**Rape.** A high-yielding cold-resistant selection from Lembke x Hambourg has been named Sarepta. Crosses of spring x winter rapes showed the "spring" character (shooting, flowering and seeding in the early part of the year) to be dominant and controlled by two genes. A number of spring lines with the high productivity of the winter rapes has been selected from these crosses.
The following genotypes were found to correspond to the five flower colours: normal yellow, *ABC* or *AbC*; dark orange-yellow, *ABc* or *Abc*; light yellow, *aBC*; light orange-yellow, *aBc*; and creamy-white, *abC* or *abc*.

**Pear.** Varietal differences in winter hardiness are reported.

**Strawberry.** Owing to loss of flowers by early varieties due to late frosts, it was decided to select for shortness of the period from flowering to maturity. A preliminary study of 10 varieties showed these to fall into five distinct groups.

**Chicory.** Studies on self and cross compatibility were continued.

**Tomato.** Selection for earliness and fruit quality from crosses effected in 1956 continued. Detailed analyses at different stages of development are being made on simple hybrids of widely differing parent varieties.

**French bean.** Selection for resistance to virus 1, anthracnose and *Pseudomonas phaseolicola* continued.

Volume II deals largely with yield and variety trials in various parts of France. A final section gives information on some of the new potato, wheat, oat, maize, fodder pea and vetch varieties which have been included in the official list of approved varieties during 1957–58.

**Proceedings of the IX International Botanical Congress, Montreal, August 19-29, 1959 : 2** : Pp. 444; **2A** : Pp. 41. (Absts.).

3516 *Al-Aish, M. Grass germination responses to isopropyl-phenyl carbamate and classification.* (*p. 3*).

Responses to seed treatment with isopropyl-N-phenyl carbamate varied among genera, tribes and subfamilies and were related to systematic characters. In the Festucoideae, germination was completely inhibited, while in most other groups it was stimulated. The varied reaction of the Phragmitiformes suggested that this group is an artificial aggregation. Treatment of dry seed with a 0·005% solution for 24 hr. followed by washing in water allowed the Festucoideae and Panicoideae to be distinguished.

3517 *Allen, O. N., Dickson, J. G., Flangas, A. L. & Beno, D. W. The genetic analysis of pathogenicity and serology of* Puccinia sorghi *Schw.* (*pp. 4–5*).

Four differentially pathogenic uredospore clones were inbred through the alternate host *Oxalis* and the recombinants were compared with the mother clones on allelic differential maize inbreds. The recombinants showed gains or losses in host range. Further inbreeding of the recombinants did not lead to segregation but yielded the same range of pathogenic types in each generation. "Hybridization of selected pathogenic types of sibling and nonsibling pedigree confirmed the indeterminate nature of the pathogenic locus. Antisera produced from the pathogenic types differentiated the homologous from the heterologous combinations and revealed cross-reactions with *P. graminis avenae.* On the basis of genetic origin of variability in pathogenic specificity, a 'cistron' is postulated as the genetic unit conferring specificity capable of inter-cistron recombination which modifies pathogenicity."

3518 *Atabekova, A. I. Polyploïdie spontanée du* Lupinus (*Tourn*) *L.* [*Spontaneous polyploidy in* Lupinus (*Tourn*) *L.*]. (*p. 11*).

Lupin species fall into two geographical and caryological groups. *L. angustifolius, L. linifolius* and *L. pilosus,* all with $2n = 40$, *L. albus,* with $2n = 50$, and *L. luteus,* with $2n = 52$, all belong to the Mediterranean group, while *L. arboreus, L. barkeri, L. densiflorus, L. douglasii, L. elegans, L. hartwegii, L. hybridus, L. mutabilis* and *L. nanus,* all with $2n = 48$, and *L. subcarnosus* and *L. texensis,* which have $2n = 34$, pertain to the American group. In the first group the basic chromosome number is thought to be $x = 5$, in the second $x = 6$.

3519 *Baker, H. G. Adventitious embryony in* Pachira (*Bombacaceae*) *and its taxonomic consequences.* (*p. 14*).

Facultative apomixis has been observed in *P. oleagina* in Ghana. The plants are self compatible and pollination is required for seed setting, a sexually produced embryo being formed. In addition, adventitious embryos develop, up to five embryos being present at maturity. Apomixis may be responsible for some of the taxonomic difficulties in the genus. The somatic chromosome number is 72 and pollen sterility is rather high.

3520 *Baksay, L. Cytotaxonomy, chorology and phytocenology.* (*p. 16*).

Examples of differences in chromosome number related to differences in both present and past distribution are given for a number of genera, including *Festuca. F. tatrae,* with $2n = 14$, has a limited range, while its polyploid, *F. amethystina* ($2n = 28$), reached its maximum southern range in the Illyrian and Caucasian mountain regions in the Würm III period and migrated back to central Europe in postglacial times. *F. glauca* ($2n = 14$) is a montane, subalpine plant and its polyploid, *F. pallens* ($2n = 28$), occurs in hilly regions.

3521 *Bald, J. G. Distinction between forms of tobacco mosaic virus.* (*pp. 16–17*).

Biophysical and biochemical properties of tobacco mosaic viruses and certain host reactions together with the selective capacity of host species have been used to define ecological forms of the virus. Each of several widely infected host species contains one or two distinct dominant forms. In tobacco the dominant form is U1, in *Nicotiana glauca* it is U5–U2. Isolates from tomatoes in California have properties in common with those from tomatoes in other countries and are more like U5–U2 than U1. The viruses dominant in tomato, *Plantago,* cucurbits and cowpea appear to be distinct forms. By changing the environment of the infected plant, the symptomatic expression of the virus may be altered without changing biophysical properties or certain host reactions. The properties of isolates from different host species did not accord with the belief that these forms are derived from the tobacco form.

3522 *Baranov, P. A. The progress of investigations in plant fertilization, apomixis, and polyembryony in the U.S.S.R.* (*p. 19*).

Cytomorphological, cytochemical, cytophysiological and *in vivo* methods are used in the study of the above aspects of plant reproduction. It is noted that a type of embryonic development characterized by the existence of cenocytic phase at the beginning of embryogenesis, and hitherto known only in gymnosperms, has been observed in *Paeonia* by M. S. Jakovlev.

3523 *Barthelmess, A. Permanenz von Spindelelementen bei bipolarer und multipolarer Mitose.* (*Permanence of spindle elements in bipolar and multipolar mitosis*). (*pp. 21–22*).

The following explanation of normal and aberrant mitotic behaviour is advanced. From telophase through interphase to metaphase,

each centromere is connected by means of two fibres to the two polar fields. During the dissolution of the nuclear membrane, changes in tension between the fibres cause the centromere to move from the prophase to the metaphase position. During chromosome reduplication, a new connecting fibre is laid down between the centromeres of the chromatids; this fibre undergoes expansion during anatelophase and becomes fixed and permanent at the point where it traverses the new cell wall and nucleus wall. The visible spindle consists of these fibres together with a substance with a mechanical function. Multipolar mitosis arises from dipolar mitosis through the division of one or more of the polar fields during the mitotic alteration of the nuclear membrane. Multinucleate cells with hypoploid nuclei arise only when, after an incomplete metaphase, chromatid division occurs together with sufficient expansion of the fibre which induces the new cell wall and nucleus wall; otherwise a polyploid syncaryon is formed.

3524 *Bell, W. D., Bogorad, L. & McIlrath, W. J. Studies of iron metabolism in yellow-stripe maize mutants* ($ys_1$). (*pp. 27–28*).

Heterozygous $ys_1$ plants [cf. XXIX, 1494] become equally green whether supplied with ferrous versenate or an equal amount of ferric versenate. Homozygous recessive plants, however, show different responses to the same level of the two forms of iron. Ferrous sulphate and ferric chloride were equally effective in promoting green coloration in excised leaf segments of phenotypically yellow-striped $ys_1$ plants. In studies with $Fe^{59}$, both homozygous recessive and heterozygous intact plants showed differences in uptake of ferric or ferrous ions by the roots.

3525 *Best, R. J. Exchange of determinants between strains of tomato spotted wilt virus.* (*p. 30*).

By mixed inoculation of tomato plants with the virus strains A and E, two recombinant strains have been obtained. If *A*, *B*, *C* and *D* indicate the presence of a set of genetic markers and *a*, *b*, *c*, and *d* their absence, then A = *ABcd*, E = *abCD*, recombinant 1 = *aBCd* and recombinant 2 = *abCd*. Both new strains were isolated from several experimental plants and also from the systemically invaded leaves of *Nicotiana glutinosa*, which only one of the parental forms invades systemically.

3526 *Bingham, R. T. The intra-species approach in breeding for disease resistance in trees.* (*pp. 32–33*).

It is suggested that, in a valuable endemic tree species displaying potentially useful variation in disease resistance, early breeding work should be largely intraspecific. The incorporation of resistance factors from other species may be important where pathogen races undergo rapid changes in prevalence, but generally it is considered advisable to develop separate lines of promising native and introduced species, "breeding within the native species for genetic gains of immediate usefulness," and "for greater general adaptability in promising introduced species."

3527 *Bingham, R. T. & Squillace, A. E. Heritability of resistance in progenies from blister rust resistant* Pinus monticola *selections.* (*p. 33*).

In studies involving 76 artificially inoculated progenies from blister-rust resistant phenotypes, survival rates were respectively 5·3, 9·3 and 17·9% in progenies from (*a*) average x average phenotype (control), (*b*) wind-pollinated resistant phenotype and (*c*) resistant x resistant phenotype, and respectively 19 and 48% in the best (*b*) and (*c*) progenies. Heritability of resistance, calculated from expectation mean squares, was estimated at 40%. On the assumption that further breeding would be based on the best progenies regardless of the parental combining abilities, there was a selection differential of 34·7% and an indicated genetic gain per generation of 11%. It appears unlikely that the point beyond which no progress can be made has been reached.

3528 *Bistis, G. N. Heterothallism and sexuality in* Ascobolus stercorarius. (*p. 34*).

"The relationship between sexuality and the functions of the mating-type locus has never been revealed in any heterothallic ascomycete. In *Ascobolus stercorarius* the early stages of sexual reproduction involve the interactions between a unicellular fertilizing element and a mature mycelium upon which are formed the ascogonia. However, these interactions occur only when the fertilizing element is from one incompatibility class and the ascogonial parent from the opposite class. At least two blocks to self-fertility have now been identified. The first is the 'sexual activation' of the fertilizing element. The second occurs after plasmogamy and involves the maturation of the fruit body."

3529 *Bolsunov, I. Possibilité de prédire, chez les plantes autogames, la manifestation du phénomène d'hétérosis par le phénotype des parents.* (*The possibility of predicting the occurrence of the phenomenon of heterosis in autogamous plants from the phenotype of the parents*). (*pp. 38–39*).

Heterosis is most frequently found in crosses of the following types: interspecific crosses; hybridization between subspecies; hybridization between varieties from widely separated regions; and crosses between morphologically contrasting forms. Further, parents may be chosen according to the phenotypic expression of quantitative characters influenced by the environment; this method has been employed in *Nicotiana tabacum, N. rustica* and some other autogamous plants.

3530 *Boone, D. M. & Keitt, G. W. Genetics and nutrition of* Venturia inaequalis *in relation to its pathogenicity.* (*p. 40*).

In addition to work previously reported [cf. 1352], the following results are mentioned. Mixtures of different biochemical mutants grew synergistically *in vitro* and *in vivo* on apple seedlings. A chromosome number of seven was found cytologically, and genetical linkage of markers to seven centromeres was established. "Examples were found of single-gene control of resistance in the host to all known races of the fungus, to certain races, or to only certain lines. In other cases control of resistance appeared to be multigenic. Polyphenolic compounds in the host were shown to be of potential importance in relation to disease resistance."

3531 *Bowden, W. M. Cytotaxonomy of the wheats and their allies.* (*p. 43*).

[Cf. 249].

3532 *Brewbaker, J. L. Incompatibility and the pollen grain.* (*p. 46*).

[Cf. 107].

3533 *Brock, T. D. Physiological processes in the conjugation of mating types in the yeast* Hansenula wingei *Wickerham.* (*pp. 47–48*).

Conjugation appears to be due to induction of a budding enzyme in each cell at the point of contact with its opposite mating type, resulting in digestion of each cell wall at this point and thus allowing fusion of the cell contents to take place.

3534 *Brown, W. V. Apomixis in the grass subfamily Panicoideae.* (*pp. 49–50*).

[Cf. XXVIII, 4277].

3535 *Brown, W. V. Grass leaf anatomy: its use in systematics.* (*p. 50*).

[Cf. XXVIII, 4278].

3536 *Bubar, J. S. Self-sterility and self-incompatibility in* Lotus corniculatus *L.* (*p. 50*).

Self incompatibility is expressed through retarded pollen-tube growth rates and is probably controlled by *S* alleles, while self sterility appears to be caused by postfertilization abortion phenomena and involves polygenes and heterosis. The genetic mechanisms for self sterility and self incompatibility are probably independent, so that it should be possible to produce self-fertile lines with an effective self-incompatibility system and, once inbreeding depression is overcome, inbred lines for use in the development of commercial hybrids.

3537 *Buxton, E. W. Factors affecting pathogenic* Fusarium oxysporum *in the rhizosphere of peas.* (*pp. 54–55*).

Root exudates from three varieties depressed the germination of the races of *F. oxysporum* f. *pisi* which the varieties resisted and increased that of those to which they were susceptible. Water extracts from the rhizosphere had the same effect as the exudates. Onward, which is susceptible to race 1, supported a greater rhizosphere microflora than did the resistant varieties Wilt-Resistant Alaska or Delwiche Commando. Plants became less severely wilted in soil previously cropped with Wilt-Resistant Alaska or Delwiche Commando than in soil in which either Onward or no peas had been grown. Inhibition of growth of *F. oxysporum* f. *pisi* in agar was caused by some of the rhizosphere fungal and bacterial species and was increased by the addition of root exudates and further increased by soil extract. It is suggested that substances exuded by the roots of varieties resistant to race 1 alter the composition and metabolic activity of the rhizosphere microflora and prevent race 1 from germinating, thus lowering the amount of effective inoculum and decreasing the severity of wilt.

3538 *Buxton, E. W. Mechanisms of variation in the pathogenicity of* Fusarium oxysporum. (*p. 55*).

[Cf. 1354].

3539 *Callaham, R. Z. Experimental taxonomy —more than seed source studies.* (*p. 57*).

The possibility of obtaining speedier results by employing physiological, biochemical, genetical, cytological and morphological methods as well as seed-source tests in the study of variation in forest-tree breeding material is discussed.

3540 *Callaham, R. Z. Temperature and seed germination for races of ponderosa pine.* (*pp. 57–58*).

Significant regional and local differences in the germination energy and germination capacity of half-sib progenies from 20 sources were found at most of the five germination temperatures 8°, 16°, 24°, 30° and 36° C. Material from the North American interior, particularly from Nebraska, germinated most rapidly at all temperatures. Optimum germination energy occurred at lower temperatures in material from the interior than in that from coastal areas and the Pacific Northwest.

3541 *Callen, E. O., Bubar, J. S. & Grant, W. F. Studies in the genus* Lotus (*Leguminosae*). (*p. 58*).

In addition to the revision of the genus published elsewhere [cf. XXIX, 2770], the following chromosome numbers are presented: subgenus *Pedrosia*, one species $2n = 28$, the rest $2n = 14$; *Edentolotus*, $2n = 12$, 14, 24 and 28; *Deflectostylus*, $2n = 12$ and 14; and *Tetragonolobus*, $2n = 14$. It is specially noted that the North American species include a group with $2n = 12$, as do the old World species, but lack any tetraploids, with possibly a single exception. The two native Australian species have $2n = 28$.

3542 *Celarier, R. P. Cytogeography of the Old World Bothriochloeae* (*Gramineae*). (*p. 62*).

Cytological and morphological studies have been made of the complex species *Bothriochloa ischaemum, B. pertusa, B. intermedia, Dichanthium annulatum* and *D. caricosum*. Diploids have been found only in *Dichanthium* and pentaploids only in *Bothriochloa*, but tetraploids and hexaploids have been found in all the complexes. Meiotic behaviour is regular in the diploids, variable in the tetraploids and highly irregular in the others. Each complex includes two or more distinct morphological types correlated with chromosome number and behaviour as well as geographical distribution.

3543 *Chao, C.-Y. Heterotic effects of a chromosomal segment in maize.* (*p. 65*).

[Cf. XXVIII, 4153].

3544 *Chennaveeraiah, M. S. Karyomorphological studies in* Aegilops *L.* (*p. 68*).

Studies have been made of 12 diploid species ($2n = 14$), eight tetraploid species ($2n = 28$), two species (*Ae. crassa* and *Ae. triaristata*) which occur in both tetraploid and hexaploid forms, and one species (*Ae. juvenalis*) known only as a hexaploid ($2n = 42$). Caryotypic differences were associated with morphological differences. Tetraploid and hexaploid forms of the same species differed both caryotypically and morphologically, and also in geographical distribution; it is therefore suggested that they be regarded as distinct species.

3545 *Christensen, J. J. Somatic variation in the rust fungi.* (*pp. 72–73*).

New forms of rust may be obtained through anastomosis of germ tubes arising from uredospores and ecidiospores or hyphal fusion in the host, some mixtures of rusts giving many new biotypes, others few. From a mixture of uredospores of two stem-rust races, as many as eleven forms, including several new ones, were obtained, suggesting that not merely nuclear reassortment but also some form of parasexual process may be involved. New biotypes having two or more nuclei per cell are unstable, but when nuclear dissociation occurs, the dicaryotic biotypes formed are stable. Biotypes arising from uredospore mixtures of two races of *Puccinia graminis* were somewhat similar in pathogenicity to those produced by sexual hybridization on barberry.

3546 *Church, G. L. Introgressive hybridization in Minnesota species of* Elymus. (*p. 73*).

Forms intermediate between *E. canadensis* and *E. diversiglumis* occur naturally in Minnesota and are vigorous and fertile in spite of occasional meiotic irregularities and 10–20% lower chiasma frequencies. Comparable forms have been produced artificially by back crossing sterile $F_1$ hybrids to *E. canadensis*. Crosses of *E. diversiglumis* with sympatric *Hystrix patula* gave a few weak $F_1$ seedlings, but crosses of *Hystrix* and *E. canadensis* were unsuccessful. It is suggested that *E. diversiglumis* may have arisen from the latter cross in the remote past and is now separated by genetic barriers from *Hystrix* but not from *E. canadensis*. *E. wiegandii* also occurs in the area and shows varying degrees of meiotic irregularity due to neocentric chromosomes or structural hybridity; an artificial cross with *E. canadensis* has yielded vigorous $F_1$ seedlings.

3547 *Converse, R. H.* In vitro *test of host-parasite relations of pecan scab.* (*pp. 78–79*).

When conidiospores of four races of pecan scab (*Fusicladium effusum*) were placed on water agar together with leaflet discs from five pecan varieties, the germ tubes of spores near discs of susceptible varieties were generally longer under standard conditions than those of spores near discs of resistant varieties.

3548 *Cooper, D. C. The embryo and endosperm in hybrids.* (*p. 80*).
The failure of endosperm development associated with hyperplastic development of adjacent maternal tissues and the consequent starvation of the embryo that occurs in some hybrids is described. If the embryos reach a sufficiently advanced stage of development they may be excised and artificially cultured.

3549 *D'Amato, F. Cyto-histological investigations of antimitotic substances and their effects on patterns of differentiation.* (*p. 85*).
Studies have been made of the relation of (*a*) preprophase inhibition or mitostatic action to growth in meristematic regions; (*b*) spindle inhibition or c-mitotic action to cell variation and to the development of chimeras and mosaics; and (*c*) cytocinesis to the occurrence of polynucleate tissues.

3550 *Davidson, D. Cell lineages in meristems of irradiated roots.* (*p. 87*).
Mitotic cells with aberrant chromosomes occur in roots of *Vicia faba* after X irradiation and have been found 21 days after treatment. In roots which were growing slowly as a result of treatment with 600 r., groups of cells with a similar aberration were found, suggesting that the cells in each group were descended from one cell and were able to undergo mitosis during the period of slow root growth. "There is evidence that these cells are responsible for the restoration of meristematic activity and thus for the later growth of the root."

3551 *DeLamater, E. D. & Echlin, P. Observations on the isolated nuclei and chromosomes of* Bacillus megaterium *by cytochemical and electron microscopic techniques.* (*p. 88*).
[Cf. XXIX, 2233 and XXX, 1073].

3552 *Delaporte, B. Nouvelles observations sur la structure nucléaire des bactéries.* (*New observations on the nuclear structure of bacteria*). (*p. 89*).
By means of various fixing and staining techniques, the nuclear material of *Bacillus enterothrix, B. camptospora, B. collini,* numerous smaller bacteria and *Spirillum praeclarum* and another large *Spirillum* was found to consist of a fine network in direct contact with the cytoplasm and having no separating membrane. No rearrangement of nuclear material was observed during cell division but a chromatic filament joining the two halves before they separated completely was seen.

3553 *Devreux, M. Phylogénèse des bananiers comestibles.* (*Phylogeny of edible bananas*). (*p. 92*).
Crossing of edible bananas with subspecies of *Musa acuminata* and *M. balbisiana* has given rise to diploid and tetraploid hybrids and, by back crossing, to triploids. From studies of variation in pollen grain size and detailed phenotypic observations the following conclusions are drawn: (1) dessert bananas (AAA) contain a genome of *M. acuminata* ssp. *malaccensis,* as shown by the production of completely fertile diploid hybrids; (2) the genomes of *M. acuminata* and *M. ornata* are not closely related, the diploid hybrids giving tetraploids on being back crossed to one of the parents; (3) numerous tetraploid hybrids obtained from crosses between the variety Argent [Silver] (AAB) and ssp. *malaccensis* give the triploids AAA and AAB on being back crossed; (4) in all the plantains observed (AAB), one A genome appears to derive from ssp. *burmannica* 'Long Tavoy'; (5) the two forms Long Tavoy and Calcutta 4, placed by Simmonds in ssp. *burmannica,* both appear to merit subspecific rank; and (6) the forms Ceylon, Brachycarpa and Mindanaensis could be regrouped as subspecies of *M. balbisiana.*

3554 *Dropkin, V. H. & Nelson, P. E. The pathogenicity of* Meloidogyne *sp.* (*root-knot nematodes*). (*p. 97*).
In studies of 19 soya-bean varieties infected with *M. incognita* and *M. incognita acrita,* "giant" cells in susceptible hosts were large, with clear cytoplasm and thick walls, while those in hosts which do not support the parasite vary between the above type and small, malformed necrotic cells.

3555 *Dunn, D. B. Breeding systems existing in the genus* Lupinus (*Fabaceae*). (*pp. 99–100*).
Among North American species, most of the annual plants tested have proved to be self compatible and many are almost obligate self pollinators. One annual is almost self sterile. Perennials are generally insect pollinated, one being self sterile and most showing a preference for cross pollination. Interspecific sterility barriers occur in some perennial species, but most allow some introgressive hybridization to take place. One species permits introgression with several others in only one direction.

3556 *Dutta, S. K., Hall, C. V., Heyne, E. G. & Hansing, E. D. Nutritional control of pathogenicity of* Colletotrichum lagenarium *Ell. and Halst.* (*p. 100*).

Avirulent nutritional mutants induced by ultraviolet irradiation of a virulent strain became temporarily virulent on inoculated seedlings of the water melon Black Diamond when the required histidine, serine, leucine, isoleucine, inositol or proline was supplied in aqueous solution to the leaf surface. Virulence of non-pathogenic mutants requiring pyrimidine, however, could not be restored. All mutants except those requiring pyrimidine were able to grow in whole-tissue homogenates of all resistant and susceptible varieties tested but showed differential growth responses in extracts from the epidermal layers of stems and leaves of different varieties. It appears that the fungus utilizes only the epidermal layer during establishment and that the mutants were avirulent because of inadequate nutrition at the site of infection.

3557 *Echlin, P. & DeLamater, E. D. The cytochemistry of the nucleus of* Bacillus megaterium. (*p. 101*).

Treatment of *B. megaterium* with sodium glycocholate clears the cells and renders them susceptible to disruption by ultrasonic waves. Centrifugation of the cell fragments allows the isolation of nuclear material [cf. XXIX, 2233]. Viscometry studies and ultraviolet spectrophotometric analysis indicate that the glycocholate and ultrasonic treatments used do not cause any significant polymerization of the DNA. The site of action of the glycocholate appears to be the capsule and cell wall.

3558 *Ehrendorfer, F. Polyploidie, Hybridisierung und Evolution: Ergebnisse vergleichender phylogenetischer Studien an* Galium, Knautia *und* Achillea. (*Polyploidy, hybridization and evolution: results of comparative phylogenetic studies with* Galium, Knautia *and* Achillea). (*p.* 102).

Similar phylogenetic relationships have been found in the above genera and the following observations on polyploids are recorded. Allopolyploidy has been of greater importance than autopolyploidy, the rate of polyploid production being increased by hybridization. Primary polyploids from crosses between diploid species and subspecies may give rise to secondary polyploids through further crosses. Extensive genome homology occurs, but formation of univalents and multivalents is restricted by various cytogenetic mechanisms. Barriers to crossing appear to be reduced with increasing polyploidy. The polyploids combine genetic material from various isolated, relict diploids and are aggressive and able both to colonize bare postglacial areas and to penetrate into young plant communities. The characters of the polyploids are generally intermediate between those of the diploid initial forms; their spontaneous mutation rate is lower and their further differentiation is thus hindered. Nevertheless, polyploidy is regarded as an important means of overstepping the limits set up by the establishment of rigid crossing barriers in diploids.

3559 *Erwin, D. C. Crumple leaf, a virus-induced disease of cotton.* (*pp. 106–07*).

Differences in symptoms and in severity of reaction to the above virus were found among *Gossypium* species and varieties. *G. hirsutum* 'Acala 4–42' was severely infected; *G. barbadense* 'Sakel L' and 'Sakel Domain' were also badly affected but differed slightly in symptoms; several *G. herbaceum* varieties resemble Acala 4–42 in reaction; and *G. arboreum* and *G. hirsutum* were immune or highly resistant. The virus was occasionally recovered from symptomless plants.

3560 *Fairbrothers, D. E. & Johnson, M. A. The precipitin reaction as an indicator of relationship in the subfamily* Festucoideae *of the family* Poaceae (*Gramineae*). (*pp. 110–11*).

Strong or fairly strong serological correspondences were detected among the species *Festuca rubra, Dactylis glomerata, Lolium perenne, Poa pratense* and *Bromus inermis*, while *Eragrostis curvula* and *Tridens flavus* showed weak or negative preciptin reactions with the above species. Six *Bromus* species could be distinguished serologically, *B. rubens* and *B. carinatus* showing greater correspondence with *B. inermis* than *B. catharticus, B. stamineus* and *B. mollis*.

3561 *Farkas, G. L., Király, Z. & Solymosy, F. The biochemical mechanism of hypersensitive reaction in rust- and virus-infected plants.* (*p. 111*).

[Cf. 1143].

3562 *Favarger, C. Vicariance entre races chromosomiques dans la flore alpine.* (*Vicariation between chromosome races in the Alpine flora*). (*pp. 112–13*).

Vicariant chromosome races have been studied in several species and in each case the most highly polyploid races had the most eastern distribution.

3563 *Fetner, R. H. Distribution of ozone-induced chromosome breakage in* Vicia faba. (*p. 114*).
The frequencies of chromosome aberrations induced in SAT-chromosomes and S-chromosomes by treatments with ozone, X rays and methyl-bis (β-chloroethyl)-amine hydrochloride were compared. Ozone-induced breakage was less random than X-ray-induced breakage and more nearly random than that induced by nitrogen mustard.

3564 *Flor, H. H. Complementary gene interaction in the rusts.* (*pp. 115–16*).
The basis of the author's theory that for each gene conditioning rust resistance in flax there is a corresponding gene controlling pathogenicity in the rust is outlined.

3565 *Fryxell, P. A. The evolutionary position of inbreeding systems.* (*p. 125*).
Inbreeding, like apomixis, is sometimes described as an evolutionary "blind alley", since it leads to the loss of the genetic variability normally maintained by means of outbreeding mechanisms. The author suggests that it can be so described only when it is obligate and points out that this is rare in nature. "Facultative inbreeding can be a successful compromise since occasional outbreeding provides a continuing supply of variability. It can be successful in terms of long-term survival, not merely immediate survival".

3566 *Fyfe, J. L. Evaluation in inbred lines of tetraploid lucerne.* (*pp. 127–28*).
In a comparison of all possible crosses between six slightly inbred lines, most of the variability between progeny means for yield and other characters could be accounted for in terms of general combining ability and experimental error, contributions by specific combining ability being small and nonsignificant. "Tests of general combining ability should, therefore, be adequate to identify superior inbreds. With tetrasomic inheritance, a cross between unrelated parents has one-third the inbreeding coefficient (*F*) of the parents. Forage yields of lucerne show a linear relation with *F*. In arguing from the general level of yield of a group of single crosses to that of the corresponding double crosses, this relation allows a single adjustment for the reduction in *F*."

3567 *Gallegly, M. E. & Alexander, L. J. Fundamental aspects of disease resistance in tomato to* Phytophthora, Fusarium, *and tobacco mosaic virus.* (*p. 129*).
Resistance to race 0 of *Ph. infestans* is conferred by the gene $TR_1$ and to race 1 of *F. oxysporum* f. *lycopersici* by *I*, located in linkage group V. Certain physiological races of the two pathogens attack plants carrying these dominant genes. Multigenic resistance to both diseases is also known, but the number of genes involved has not been determined. Different types of resistance to tobacco mosaic virus are conditioned by one dominant gene, two dominant genes and three recessive genes, but some virus strains attack plants carrying known types of resistance. Plants with $TR_1$ react rapidly to infection with *Ph. infestans* race 0 by producing necrotic spots which are probably infiltrated with toxic phenols. Infected wilt-resistant plants have a higher phenol content than healthy resistant plants, whereas the contents of infected and healthy susceptible plants are the same. Resistance to tobacco mosaic virus involves prevention of symptom expression and reduction or prevention of infection. New pathogenic races may arise through mutation or, as in *Ph. infestans*, through sexual recombination.

3568 *Garber, E. D. Biochemical mutants of toxigenic, bacterial phytopathogens.* (*p. 130*).
Ultraviolet irradiation of *Pseudomonas* species which produce exotoxins around the site of infection yielded mutants 85–95% of which showed a specific type of nutritional deficiency. *Ps. tabaci* gave mostly methionine-requiring mutants requiring aromatic aminoacids or nicotinic acid; and *Ps. phaseolicola*, mutants requiring glutamic acid, aspartic acid or proline. In *Ps. tabaci*, the exotoxin has been identified as an antimetabolite of methionine, an aminoacid whose biosynthesis here appears to differ from that in other species. These observations show that the exotoxin may be a consequence or by-product of methionine biosynthesis in this species, and it is thought that in other species a similar relationship between nutritional requirements and exotoxin production may occur.

3569 *Garber, E. D. Nutritional aspects of the host parasite relationship.* (*p. 130*).
The following mechanisms have been proposed to interpret the avirulence of certain nutritionally deficient mutants on specific hosts: (1) the concentration of a nutrilite required by the pathogen is inadequate at the site of inoculation; (2) an adequate concentration of the nutrilite is present but its uptake is inhibited by other compounds; (3) the concentration of the nutrilite is sufficient, but other compounds are needed to facilitate its uptake.

3570 *Gerassimova-Navashina, H.* [*Gerasimova-Navašina, E.*]. *The cytology of fertilization in flowering plants.* (*p. 132*).

After a description of the events leading to double fertilization [cf. XXIX, 986], it is stated that the various kinds of sexual fusion fall into one of the following two basic types: (1) the premitotic type, corresponding to the sea-urchin type, in which the ♂ gametes enter the ♀ nuclei immediately upon contact and undergo their resting stage within; and (2) the post-mitotic type, corresponding to the *Ascaris* type, in which the ♂ gametes undergo their resting stage while still outside the ♀ nuclei, sexual union taking place only during the first cleavage of the zygote. Transitional types also occur.

3571 *Gloushchenko* [*Gluščenko*], *I. E. & Tovmasjan, O. V. The mentoring action of the foreign pollen in self-pollinating corn lines.* (*pp. 134–35*).

When inbred lines of the maize varieties Bezenčuk 41 and Belojaroe pšeno [White-Spring Millet] were pollinated with a 1 : 2 mixture of own pollen and hemp or sunflower pollen, the following increases compared with the results of pure self pollination were observed: in Bezenčuk, 66–82% more grains per ear, 23–29% greater plant height and 28–50% longer ears; in Belojaroe pšeno, 12–64% higher grain number, 6–28% greater plant height and 4–66% longer ears; and in both a doubling of the quantity of green matter. In subsequent generations, the vigour of the self-pollinated lines was retained even when no further foreign pollen was used.

3572 *Gould, F. W. Polyploidy in grasses of southwestern United States.* (*pp. 138–39*).

Among 200 grasses native to the southwest and 202 native to the southeast, respectively 75% and 60% are polyploid, the difference being largely ascribable to the relatively large number of diploid *Panicum* forms in the latter region. A hundred native Texas grasses, selected as being widespread and abundant, also included 75% polyploids. Based on reported chromosome counts, the percentages of taxa with polyploid genotypes in the chief genera of Texas grasses are as follows (numbers of species in brackets): *Eragrostis* (10), *Setaria* (7) and *Poa* (7), all 100%; *Sporobolus* (12), 92%; *Stipa* (9), 89%; *Chloris* (7), 86%; *Paspalum* (19), 84%; *Muhlenbergia* (15), 73%; *Tridens* (7) and *Bromus* (7), 71%; *Andropogon* (21), 62%; *Bouteloua* (13), 54%; *Aristida* (8), 37%; and *Panicum* (64), 36%.

3573 *Grant, W. F. Polyploidy and interspecific hybridization in* Amaranthus. (*pp. 139–40*).

[Cf. 2024].

3574 *Grassl, C. O. Introgression between* Saccharum *and* Miscanthus *in New Guinea and the Pacific area.* (*p. 140*).

"Cultivated and semi-wild plants in the Pacific area known under the names of *Erianthus maximus* Brongn. and *Saccharum pedicellare* Trin. are considered to have originated from hybridization between *Saccharum* and *Miscanthus*. Characteristics believed to have been derived from *Miscanthus* are known to be present in some of the native chewing canes (*Saccharum officinarum* L.), particularly in many of those originally found in Hawaii. In the highlands of New Guinea somewhat similar but much more complex and variable plants were found to be common in native gardens and as widespread escapes from cultivation. In New Guinea and possibly to some extent in Fiji, *Saccharum robustum* is considered to be the main species of *Saccharum* involved in the production of the complex hybrids in question, while in the Pacific area, particularly the Society islands and New Caledonia, *S. officinarum* is also or exclusively involved. *Miscanthus floridulus* (Labill.) Warb., a common arrow plant in native gardens and widespread as a weed in the highlands of New Guinea, is considered to be the *Miscanthus* species involved in this area. A new generic name is proposed for the bi-generic hybrids." [Author's summary].

3575 *Hagen, G. L. Tumor formation in the hybrid tobacco* Nicotiana glauca *x* N. langsdorffii. (*pp. 147–48*).

Tumour formation occurs spontaneously in the above hybrids and may be increased by treatment of the plants with ionizing radiation. A technique for locating the induced tumours is described.

3576 *Haller, J. R. The role of hybridization in the origin and evolution of* Pinus washoensis. (*p. 149*).

There is evidence that *P. washoensis*, which has a limited distribution on high morainic slopes on Mount Rose in western Nevada, may have arisen through introgression of *P. jeffreyi* into *P. ponderosa*, possibly as recently as the Pleistocene. *P. washoensis* still hybridizes readily with *P. ponderosa* where the two species occur together on the lower slopes but does not cross with *P. jeffreyi*, which is sympatric with *P. washoensis* on the higher slopes.

3577 *Hansing, E. D. Correlation between loose smut infection of wheat under artificial and natural conditions.* (*p. 150*).

The percentages of smutted heads in material artificially infected with prevalent races of *Ustilago tritici* and in naturally infected samples were, respectively, as follows: Pawnee, 2, 0·001; Triumph, 10, 0·008; Ponca, 11, 0·03; Comanche, 47, 0·04; Wichita, 48, 0·2; Tenmarq, 51, 0·3; Concho, 52, 0·5; Cheyenne, 57, 1·5; and Red Chief, 64, 2·2. The ratios between artificial and natural infection plotted against artificial infection indicated a linear relationship for the resistant varieties Pawnee, Triumph and Ponca and a curvilinear relationship for the remaining, susceptible varieties.

3578 *Harney, P. M. Some effects of seed treatment with the anti-auxin maleic hydrazide* (*MH*) *on tomato chromosomes.* (*p. 151*).

In anaphase cells of root tips from tomato seeds treated with aqueous solutions of maleic hydrazide in concentrations of $10^{-2}$ M, $10^{-3}$ M and $10^{-4}$ M, bridges and fragments were present in frequencies up to 48%. These cytological abnormalities were also observed in the $C_2$ generation in root tips from germinated seed, root tips from growing plants and pollen mother cells, suggesting that they are carried over to successive generations by a breakage-fusion-bridge cycle. Phenotypically, treatment seems to increase the frequency of rogue tomatoes in the second generation and to induce a number of unclassified abnormal types which show as high a frequency of aberrant root-tip anaphases as the $C_1$. Although pollen mother cells exhibit a very high incidence of bridges and fragments, pollen sterility does not appear to be greater than in the controls.

3579 *Harte, C. Cytological and genetic studies on mutants of* Oenothera *originating after irradiation with radio waves.* (*p. 152*).

Irradiation of pollen grains of *Oe. hookeri* with radio waves of 2 and 3 m. wavelength for 2 or 4 hr. and of whole plants for the entire vegetation period led to the production of several mutants and many mosaics with small-leaf sectors in the second generation. The small-leaf sector was in some cases homozygous for a recessive mutation while the normal part was heterozygous, and in other cases heterozygous for a dominant mutation while the normal part was homozygous. Some of the mutants had normal chromosomes, others had a reduced chiasma frequency or a reciprocal translocation.

3580 *Heiser, C. B.* (*Jun.*). *Natural hybridization and introgression with particular reference to* Helianthus. (*p. 158*).

Of the 51 species of *Helianthus*, 23 are known to be involved in interspecific hybridization; of the remainder, the seven which have been sufficiently studied do not hybridize. Most perennial diploids, even when on morphological grounds they appear to be distantly related, give fertile $F_1$ interspecific hybrids, and introgression is common. Hybridization also occurs among the polyploid perennials, but the amount of introgression is not readily assessed, since effects similar to introgression may result from allopolyploid segregation. Introgression is also known among annuals, although $F_1$ plants are rather sterile. It is thought that primary and secondary speciation through hybridization may occur in the genus.

3581 *Heslop-Harrison, J. Photoperiodic effects on sexuality, breeding system and seed germinability in* Rottboellia exaltata. (*pp. 162–63*).

Following exposure of the short-day grass *R. exaltata* to 8 hr. photoperiods from germination onwards, the three male flowers of the alicode are sterile and pollen is produced only in the hermaphrodite flower, which is customarily self pollinating. With an increasing number of 14-hr. photoperiods interpolated prior to the short photoperiods required for flower induction, pollen production increases, pollen fertility in all four flowers of the alicode being attained with 30 weeks or more of long days. Under these conditions there is apparently a high level of outbreeding. Structural dissimilarities in the dispersal units and differences in seed germination occur between plants exposed to the different photoperiods.

3582 *Hirschhorn, E. Abnormalities of* Ustilago maydis *from Cuzco, Peru.* (*p. 166*).

Abnormalities of growth and structure have been observed among 300,000 chlamydospores and 426 monosporidial cultures collected from three localities at an altitude of 3100 m. in Cuzco. Both normal and abnormal sporidia were produced by cultures from normal sporidia and by those from abnormal sporidia, and abnormal sporidial types originated during both sexual and asexual reproduction, indicating the irregularities are not all attributable to one hereditary mechanism. "The abnormalities were diminished in cultures grown on glucoside broth. Monosporidial cultures did not infect maize known to be susceptible to *U. maydis*. The peculiar cultural characteristics and

abnormalities of *U. maydis* from Cuzco appear to be caused by a mutation, endemic and widely dispersed in the area".

3583 *Holst, M. J. & Yeatman, C. W. A provenance study in* Pinus banksiana *Lamb.* (*pp. 169–70*).

*P. banksiana* from 12 districts in Ontario was grown for eight years at the Petawawa Forest Experiment Station, Chalk River, Ont. There was a trend for trees from areas with longer growing seasons (southern coastal) to be taller than those from areas with shorter growing seasons (northern and continental). The wide variation in height between trees from the same climatic and geographic zone may be related to the discontinuous distribution of the species.

3584 *Hu, S.-Y. The taxonomy, geography, and economic importance of the genus* Fraxinus *in China.* (*p. 172*).

The need for a revision of the genus is pointed out. A new subgenus regarded as primitive and containing five species is described from the tropical and subtropical regions of China. Affinities have been detected between American species and two Chinese species and between a European species and two other Chinese species.

3585 *Hubbeling, N. Inheritance and interaction of genes for disease resistance in* Phaseolus vulgaris *L.* (*pp. 172–73*).

About eight dominant allelic genes appear to be involved in controlling resistance to races $\alpha$, $\beta$, $\gamma$ and $\delta$ of *Colletotrichum lindemuthianum*; they do not appear to be linked with any other genes for disease resistance. Anthracnose-resistant selections obtained are undergoing further breeding to incorporate genes for resistance to halo blight, common and yellow bean mosaic and stipple streak.

3586 *Hunziker, J. H. The origin of* Agropyron scabriglume. (*pp. 173–74*).

*A. scabriglume* ($2n = 42$) was crossed with an undescribed species referred to as *A.* 'Tilcara' ($2n = 28$), which has a mean metaphase configuration of $13{\cdot}96_{II} + 0{\cdot}06_{I}$. The hybrid ($2n = 35$) had $0{\cdot}43_{III} + 13{\cdot}45_{II} + 6{\cdot}80_{I}$. The mean number of closed bivalents was 12·64 in both the hybrid and *A.* 'Tilcara,' the modal numbers being 12 and 12 respectively. Pollen and seed fertility in the hybrid were 46·5 and 30·5% respectively. The agreement between mean numbers of bivalents and closed bivalents in the hybrid and *A.* 'Tilcara', together with certain morphological resemblances between the two species, suggests that probably *A.* 'Tilcara', or a species very closely related to it, is the tetraploid parent of *A. scabriglume.* Certain *Hordeum*-like morphological characteristics of *A. scabriglume* further suggest that the other parent may have been a diploid *Hordeum.*

3587 *Hyun, S. K. Problems in seed orchard establishment.* (*pp. 174–75*).

For establishing $F_1$ hybrid seed orchards of *Pinus rigida* x *P. taeda* in Korea, the following problems are considered: (1) choice of origin of the pollen parent, certain geographical races giving better hybrids than others; (2) synchronization of flowering of the parents; (3) emasculation of the seed trees; (4) reducing variation and increasing the genotype superiority of the hybrids, e.g. by using one highly selected clone as seed parent and several highly selected clones as pollen parents; (5) promotion of fertile seed production by suitable planting arrangements of the pollen trees; (6) stimulation of flowering; and (7) pruning and shaping.

3588 *Ikeda, Y. Potential application of parasexuality.* (*p. 175*).

A heterocaryon between a mutant of *Aspergillus oryzae* producing protease at an early stage of growth and one producing it at a later stage showed far greater protease production than either of the mutants or the original strain; this effect may be due to a kind of heterosis. Diploid, triploid and tetraploid strains derived from a different combination of mutants were also high producers of protease. Interspecific hybrids between *A. oryzae* and *A. sojae*, however, were not improved with respect to protease production. A kojic-acid producing strain and a nonproducer have been used to obtain a strain with improved kojic-acid production.

3589 *Islam, A. S. Crossing relationships in the genus* Corchorus. (*pp. 177–78*).

*C. depressus* used as female parent gave fertile hybrids when crossed with *C. olitorius* or *C. capsularis* but the reciprocal crosses yielded no viable seeds. Apparently viable seeds have been obtained from (*C. depressus* x *C. olitorius*) x *C. capsularis* and the reciprocal. *C. olitorius* has been successfully crossed with a new species from Sind, West Pakistan, and appears to be closely related to this species and to *C. depressus* but not to *C. aestuans, C. trilocularis, C. capsularis, C. fascicularis* or a natural tetraploid ($2n = 28$) of *C. siliquosus.* Fruits were set in the cross *C. aestuans* ♀ x *C. olitorius* ♂ but not in the reciprocal. Fruits but no viable seeds were obtained in both combinations of *C. olitorius* x *C. capsularis*, but when *C. capsularis* was the ♀ parent, hormone treatment of the

pedicel of the pollinated flowers was necessary. The tetraploid strains of these two species behaved similarly on being crossed, except that more fruits were set in both cases.

3590 *Jewell, P. F. & Henry, B. W. Breeding for resistance to southern fusiform rust.* (*pp. 181–82*).

Mass inoculation of seedlings up to three years old with *Cronartium fusiforme* resulted in macroscopic symptoms on 70–80% of the seedlings from susceptible species eight months after treatment; a close correlation between early leaf or stem symptoms and later canker development was found. In seedlings resulting from open pollination of rust-free *Pinus elliottii* selected in areas of high natural incidence, initial symptoms but no cankers occurred. $F_1$ progenies from *P. mitis* x *P. elliottii* and *P. mitis* x *P. taeda* were consistently free from cankers, regardless of initial symptoms. In the field, $F_1$ progenies of *P. mitis* x *P. taeda* have remained canker-free for five years in one area of high incidence.

3591 *Kessler, B. Nucleic acids as factors in drought resistance of plants.* (*p. 190*).

Heat and drought tolerance could be induced in beans and in peach and grape leaves by application of adenine to germinating seeds, young seedlings or very young leaves. The induced tolerance was accompanied by a considerable increase in the DNA/RNA ratio and in another cytoplasmic constituent with a lipid-protein structure. In sunflower seedlings, relations between water stress, growth and nucleic acid level were found.

3592 *Klaehn, F. U. Flower ecology and flower morphology in breeding procedures.* (*p. 194*).

"Sex conditions, time of flower ripening, pollen dissemination and receptivity" have been studied in species of *Fraxinus* and *Acer* in relation to problems of intraspecific and interspecific hybridization.

3593 *Knapp, E. Meiotic segregation in green plants.* (*p. 195*).

In *Sphaerocarpus* the centromere always undergoes prereduction, while different loci show different frequencies of postreduction, according to the frequency of recombination between the centromere and the locus in question. Frequencies of more than 90% postreduction for some loci indicate that localized cross overs between them and the centromere occur. Although genetic recombination was clearly observed, bivalents without contact between the homologous chromosomes were found at diacinesis.

3594 *Knight, R. J. (Jun.). Compatibility relations in the* Convolvulaceae. (*p. 195*).

In studies of seed set after selfing, self compatibility has been found in 15 species and self incompatibility in nine. Intraspecific cross compatibility has been determined in some species and studies of pollen reaction in stigmas or in styles following self or cross pollination have also been made.

3595 *Kononalov, I. N., Lerman, R. I., Mikhaleva, E. N., Smetannikova, A. I. & Shilova, N. V. Peculiarities of the changes of physiological processes in plants correlated with frost hardiness.* (*pp. 198–99*).

In studies of frost resistance in dormant and vegetative material of *Juglans regia, Thea sinensis* and *Medicago sativa*, the following differences between frost-hardy and nonhardy plants have been found. $CO_2$ assimilation begins earlier in the morning, that is, at a lower air temperature, in hardy plants, the difference being most marked at the beginning and end of the vegetative period. Hardy plants contain more hemicellulose and water-soluble carbohydrates and their proteins show higher thermal stability. Oxidation-reduction processes are described as being more intense in hardy plants. Frost-hardy plants contain more water during the period of intense growth but show a more marked reduction, particularly in nonbound water, at the end of the vegetative period; there appears to be some relation between frost hardiness and the relative proportions of bound and unbound water. Short shoots which complete their growth early in the season are more resistant to frost than long shoots.

3596 *Ledingham, G. F. Chromosome numbers of* Astragalus *and* Oxytropis (Leguminosae). (*p. 220*).

[Cf. 14].

3597 *Lindegren, C. C. Segregation of transmissible factors among the progeny of hybrids.* (*pp. 228–29*).

Tetrad analysis in higher plants and fungi, irregular segregation demonstrated by tetrad analysis, and the segregation of plastids and other cytoplasmic granules are discussed.

3598 *Linskens, H. F. Biochemical aspects of incompatibility.* (*p. 229*).

Recent investigations of Christ, Kroh and Oehlke have shown that inhibition of pollen growth on the surface of the stigma may be due to blocking

of the enzyme system which is responsible for breakdown of the cuticle and enables the tube to penetrate the stigma.
Inhibition of pollen-tube growth within the style is associated with an increase in the deposition of callose, increased respiration and the production of glucoproteins built up by both sexual partners together; these compounds are not formed in compatible combinations. There may be a type of immunity reaction in incompatible combinations, disturbance of carbohydrate metabolism being a secondary effect.

3599 *Little, R. R. Microscopic studies of rice* (Oryza sativa *L.*) *varieties.* (*p. 232*).
The grain of twenty-five varieties were studied microscopically, the aim of the investigation being to develop small-scale methods of testing cooking behaviour.

3600 *Loegering, W. Q. Physiologic specialization in the rust fungi and its relation to changes in varietal reaction.* (*p. 234*).
The release of new rust-resistant cereals has usually been followed by the appearance of races of rust able to attack these varieties. Such races must possess a gene or combination of genes conditioning a susceptible type of infection. Such a gene may arise by mutation or it may be a recessive gene occurring in the rust population in a heterozygous condition. The genes necessary for a virulent combination may be present in the population but not together in one biotype. By hybridization or asexual mechanisms virulent combinations of genes may be produced. "Regardless of their origin, the emergence of races which condition a susceptible type infection on a previously resistant variety of a cereal is due to selection pressure of the variety against prevalent and avirulent genotypes in the rust population and subsequent increase of the races is due to selection pressure in their favor".

3601 *Lundqvist, A. J. A. Self-incompatibility in rye* (Secale cereale *L.*). (*p. 238*).
The incompatibility system involves two independently inherited and probably multiallelic loci designated *S* and *Z* [cf. XXIX, 1450]. The system is unimpaired by polyploidy and this may indicate that the two loci have a duplicate origin or it may be that the loci have a complementary action. Successful cooperation between two multiallelic loci suggests that the differences within each locus are small and do not result in unbalanced allelic interaction in diploid pollen. Unlike a similar gametophytic system involving one locus, this two-loci system increases general cross compatibility at the diploid level and decreases it at the tetraploid level.

3602 *McCune, D. C. & Galston, A. W. On the relationship of gibberellin to peroxidase activity and growth.* (*pp. 240–41*).
Using the leaf sheath of maize, it was found that the *dwarf–1* mutant has a greater peroxidase activity than the wild type and using the internode of peas, the dwarf variety Progress # 9 was found to have a greater peroxidase activity than the tall variety Alaska. Treatment with gibberellic acid caused elongation and a decrease in peroxidase activity in both dwarf plants.

3603 *McMillan, C. The role of ecotypic variation in the distribution of the grasslands of Central North America.* (*p. 243*).
Twelve species from grasslands distributed in the region between Saskatchewan and Manitoba in the north and New Mexico and Texas in the south were grown at Lincoln, Nebraska and Austin, Texas. Most species showed patterns of ecotypic variation; early-flowering variants came from northern and western communities and later-flowering variants from southern and eastern regions.

3604 *Maissourian, N. A. Histoire de la culture du lupin.* (*A history of the cultivation of the lupin*). (*pp. 247–48*).
The development of cultivated varieties in America and in Europe is discussed.

3605 *Matthews, J. D. The flowering of some clones of beech* (Fagus sylvatica, *L.*). (*p. 255*).
Observations were made on the flowering of 13 clones produced by grafting scions from adult trees on to juvenile rootstocks. Considerable variation was found between clones in the time of first flowering and in flowers produced. One clone flowered in the third season after grafting, four in the fourth season and three have not yet flowered, eight seasons after grafting. The flowering of most grafts has tended to be biennial; partial stem girdling resulted, with some exceptions, in increased flowering in the following season.

3606 *Medvedeva, G. B. Role of supplementary pollen tubes in dominance transformation in wheat.* (*p. 257*).
When pollination is carried out with a mixture of pollen from two varieties, one pollen parent provides the male gamete which fuses with the egg cell and the other influences the heredity

of the embryo by assimilation as in graft hybridization. In crosses where each pollinator had at least one dominant character not possessed by the other pollinator or the mother variety, $F_1$ and $F_2$ plants possessing dominant characters of both pollinators were obtained; also plants with dominant characters occurred in $F_2$ and $F_3$ progenies of plants with the corresponding recessive characters. [Cf. XXIX, 3639].

3607 *Mehre, K. L. & Anderson, E. Character association analysis: its use in grass taxonomy.* (*pp. 258–59*).
Each of 32 varieties of maize from southeast Asia and the Americas showed a characteristic pattern of association of morphological characters of the tassel.

3608 *Messeri, A. & Ruggeri, C. Numero cromosomico di* Eucalyptus *x* trabutti *Vilmorin* (*Myrtaceae*). [*The chromosome number of* E. *x* trabutti *Vilmorin* (*Myrtaceae*)]. (*pp. 260–61*).
*E.* x *trabutti* (*E. camaldulensis* x *E. botryoides*) was found to have a chromosome number of $2n = 22$.

3609 *Mirov, N. T. Biochemical geography of the genus* Pinus. (*p. 265*).
Turpentines obtained from oleoresins of 94 species have been analysed. Generally the same or very similar chemical components occur in turpentine from pines in western America and in eastern Asia on both sides of the Pacific. This seems to indicate that the centre of origin of the genus *Pinus* was a land mass, no longer existing, which lay between northern regions of America and Asia. Most European species appear to have reached their present situations via northeastern America but *P. sylvestris* and *P. peuce* came to Europe from the east across Asia. There is evidence of ancient hybridization between *P. sylvestris* and some eastern Mediterranean pines.

3610 *Morrison, J. W. & Rajhathy, T. Cytogenetic studies in the genus* Hordeum. (*p. 270*).
Current work on chromosome morphology, hybridization and genome relationships of species is reviewed. Several species groups have been distinguished by the morphology of the plants and of the chromosomes; chromosome numbers of 14, 28 and 42 have been found for some groups. Crosses between groups have been attempted and also hybridization with *Secale* and *Hordelymus* has been effected.

3611 *Morrison, M. S. Cytotaxonomy of the genus* Trisetum. (*p. 270*).
Fernald has placed three varieties in *T. spicatum*; these are *maidenii* ($2n = 28$), *molle* ($2n = 42$) and *pilosiglume* ($2n = 42$). It is thought that var. *molle* deserves specific rank and var. *pilosiglume* may be considered as a variety of *T. molle*. *T. subalpestre* has $2n = 24$ and *T. sibiricum* and *T. paniceum* both have 14 chromosomes; it seems that these species are unlikely to be ancestors of the *T. spicatum* line.

3612 *Moses, M. J. & Lafontaine, J. G. Components of the nucleus at interphase and during division.* (*p. 272*).
A study has been made of changes in nuclear fine structure during the mitotic cycle in meristematic root-tip cells using light and electron microscopy. In agreement with the findings of other workers, a kinked microfibril with a diameter of 100 Å has been found to be a component of chromatin. The microfibrils are integral with the linear axial elements observed in meiotic chromosomes and emerge radially from them.

3613 *Mountain, W. B. Studies on the pathogenicity of* Pratylenchus. (*pp. 273–74*).
No evidence of resistance to *Pratylenchus* has been found in tobacco or peach but tolerance has been observed; in peach rootstocks, tolerance appears to be inversely proportional to the concentration of amygdalin in the roots.

3614 *Muneta, J. & Srb, A. M. Paternal transmission of extra-chromosomal properties in* Neurospora. (*p. 274*).
After acriflavine treatment of *N. crassa*, a variant with irregular but always slow growth was isolated. This variant was used as both the maternal and the paternal parent in crosses with the wild type and no slow-growing variants were found amongst the hybrid progenies or in back crosses to the variant parent. It is suggested that an extrachromosomal property of the wild type is transmitted to the progeny by maternal and paternal parents and that this property repairs the defect of the variant. When SG, a mutant whose extrachromosomal property is transmitted only maternally in crosses with the wild type, was crossed with the slow-growing variant acting as the male parent, all the progeny were of the SG type and the reciprocal cross gave some slow growers, some SG types and some modified SG progeny. This indicates that protoperithecia of the slow-growing variant accept extrachromosomal properties provided by other strains.

3615 *Murray, J. C. & Srb, A. M. A recessive gene determining colonial growth of the mycelium and aberrant asci in* Neurospora crassa. (*p. 276*).

The mutant gene peak (*pk*) is responsible for the development of a compact aerial mycelium in the form of a peak. When two *pk* cultures are crossed, the resulting perithecia contain aberrant asci in which the spores are arranged in various ways but never in a linear fashion. The *pk* gene appears to be recessive. Dominance relationships can be determined by classical means, this being unusual for a basically monoploid organism.

3616 *Naf, U. Genetic tumors.* (*p. 277*).

Tumour development in interspecific hybrids of *Nicotiana* is discussed [cf. 643].

3617 *Nelson, R. R. Evidence of a complex compatibility locus in* Cochliobolus heterostrophus. (*p. 280*).

There is a single locus responsible for heterothallic behaviour. Some monoascosporic isolates produce sterile perithecia of normal appearance when selfed. A cross of two wild-type isolates yielded a monoascosporic strain which produced perithecia with sterile asci on selfing. The isolates were homocaryotic and may represent steps in a transition from heterothallism to homothallism. Four self-sterile monoascosporic isolates that are fertile in crosses with both parental strains were obtained from a cross of an albino strain and a strain carrying a gene inhibiting the formation of protoperithecia. "The four strains are fertile with all isolates of one compatibility group, but are fertile only with the parental isolate of the other group suggesting a genetic difference at the compatibility locus among isolates of the same compatibility group." [Cf. 1538].

3618 *Newcomb, G. B. The relationships of the pines of insular Baja California.* (*p. 281*).

The Cedros Island pine has recently been classified as *Pinus muricata* var. *cedrosensis* and the Guadalupe Island pine as *P. radiata* var. *binata*. On anatomical and morphological grounds it is thought that the two populations are more closely related than this classification indicates. Variation within the Guadalupe Island pine is probably due to introgression by *P. radiata* into a Cedros Island stock, and introgression of this stock with *P. muricata* on the Channel Islands has produced *P. remorata*.

3619 *Niederhauser, J. S. Genetic studies of* Phytophthora infestans *and* Solanum *species in relation to late blight resistance in the potato.* (*pp. 282–83*).

In *S. demissum* a series of dominant, independently inherited genes conferring resistance to specific races of *Phytophthora* has been found. Since varieties with dominant gene resistance often become infected as new races of the pathogen appear, the multigenic resistance available in *S. demissum* and other species is now being used in breeding. There is some disagreement on how new races of the pathogen arise when sexual recombination is absent or unknown but new races do appear whenever suitable *Solanum* genotypes are present to select them. When sexual oospores are functional, the potential number of physiological races may be unlimited and crosses between monozoosporic cultures have yielded races differing from both parents.

3620 *Nienstaedt, H. Induction of early flowering: a critical review of recent research.* (*p. 283*).

Older trees may be stimulated to flower by a variety of treatments but there is very little evidence that such treatments induce flowering in juvenile trees. The size of the annual seed crop and the time at which the plant becomes ready to flower are said to be the result of a combination of endogenous conditions of the plant and the environment from the time when flower-inducing stimuli begin to form until seed dispersal. "The endogenous conditions may include (1) genotype of the plant, (2) age—as it reflects the sum total of the environmental impact or the relative vigor of the plant or plant part; and (3) size—in terms of a 'balance' of tissue; a balance, for example of assimilating tissue to the total amount of meristematic area, of root to top, of hormone-synthesizing tissue to hormone-utilizing tissue." This balance influences metabolism and may therefore determine the ability to produce flowers. The effects of environmental factors and the chemical nature of flower induction are not fully understood; further studies should be related to flower production *per se* rather than to fruit or seed yield.

3621 *Oppenheimer, H. R. The origin of* Trifolium alexandrinum *L.* (*p. 288*).

Several species have been suggested as ancestors of *T. alexandrinum*. There is now evidence supporting Trabut's view that *T. berytheum* is a wild variety of *T. alexandrinum*. Selection

from *T. berytheum* growing between Gaza and Beirut and possibly from other varieties growing in the inner valleys of Palestine and Syria may have led to the development of cultivated *T. alexandrinum*. No other related species is thought to be an ancestor of *T. alexandrinum*. Wild and cultivated types coexist but there is no evidence of interbreeding in Israel.

3622 *Ownbey, M. Genomic segregation and recombination in species hybrids.* (*p. 290*).
"The widespread occurrence of successful amphidiploid plant species indicates a structural rather than a genic basis for the sterility of many interspecific hybrids. Repatterning within single chromosomes ordinarily will not account for the sterility observed, but repatterning between chromosomes will do so. If deficient gametes are inviable, the maximum fertility is given by the formula $F = \frac{1}{2n-1}$, where $n$ is the number of chromosomes repatterned through progressive reciprocal translocation. Crossing-over may decrease this value, and if the chromosomes have differentiated genically as well as structurally, it may contribute to the variability of the parental species. The viable gametes will be reconstructed parental types with respect to their structural characteristics, and this is termed genomic segregation. Their random recombination in the $F_2$ will give a 1 : 2 : 1 ratio of reconstructed parent-like and $F_1$-like individuals. This accounts for the frequency of these classes in $F_2$ progenies. Cross-over segments will behave as Mendelian units within either of the parental populations, and subsequent crossing-over within a segment may give the appearance of gene mutation. This permits the genetic analysis of species differences and provides a simple mechanism for introgressive hybridization."

3623 *Page, O. T. Variability in* Fusarium oxysporum *f.* cubense (*E.F.S.*) *Sny. & Hans.* (*p. 292*).
Isolates from Gros Michel banana plants were characterized with respect to production of pigment and fusaric acid, zinc tolerance and the results of spectrophotometric and chromatographic analyses of culture filtrates; the isolates were classified into groups.

3624 *Phillips, E. W. J. & Rendle, B. J. A new approach to the study of density variation in wood.* (*p. 300*).
The technical properties of timber depend on the distribution and the amount of wood. A method of studying variation in both these features by means of density determination on a semimicro scale has been developed. This involves using a collimated beam of $\beta$ particles from a strontium$^{90}$ and yttrium$^{90}$ source; a radial strip of wood from an increment core is scanned at 0·5 mm. intervals to show variation in density within individual rings. The results agree with those from gravimetric determinations within 2·5%.

3625 *Powers, H. R.* (*Jun.*), *Moseman, J. G. & Sando, W. J. Genetic basis of the host-parasite relationship of wheat and barley powdery mildew.* (*p. 307*).
"It was found that for each gene pair conditioning reaction in the host there was a complementary gene conditioning pathogenicity in the parasite. A susceptible-type infection resulted from any one of the following combinations of complementary genes for pathogenicity in the parasite and for reaction in the host, respectively: virulence and susceptibility, virulence and resistance, or avirulence and susceptibility. A resistant-type infection resulted only from a combination of a gene conditioning avirulence in the pathogen and a complementary gene conditioning resistance in the host. This resistant reaction was expressed regardless of any other combination of genes in the organism and host which would have otherwise produced a more susceptible-type infection. Cultures of the parasite with known pathogenic genotypes were utilized in the detection and identification of genes conditioning response in the host."

3626 *Pritchard, R. H. Irregular or non-Mendelian segregations encountered in fungi and other plants.* (*pp. 310–11*).
According to Mendelian theory, a heterozygote *A*/*a* should give two products carrying *A* and two carrying *a* but exceptions have occurred for which there is no satisfactory explanation in terms of known genetic mechanisms. Two processes have been suggested to explain the exceptions: (1) directed mutation of an allele under the influence of a homologous allele in a heterozygote and (2) copying of a segment of the genetic material twice on one of the two alternative templates in the heterozygote. Data obtained from experiments with *Neurospora* and *Aspergillus* suggest the existence of a mechanism of the second type. This implies coincidence with greater than random frequency of more than one recombination in a short segment of the linkage map. "There is evidence that a localized correlation between recombination events reciprocal or otherwise, is a feature of recombination in general, and the occurrence

of tetrads with ratios other than 2 : 2 can therefore be interpreted on the basis of a generalized theory of recombination."

3627 *Prywer, C. Meiosis in the $F_1$ hybrid of* Tripsacum maizar *Hdz. X. & Randolph x* T. zopilotense *Hdz. X. & Randolph.* (*p. 312*).

In most of the cells studied meiosis was normal but in some cells the chromosomes did not move towards the poles in anaphase I, and in telophase I the two chromosome sets remained together and a nuclear membrane sometimes formed round them. Similar aberrations were observed in the second meiotic division. Segregating populations of *Tripsacum* are common in Mexico; the plants are tetraploids with morphological characters intermediate between those of *T. maizar* and *T. zopilotense*. These populations may have originated from amphidiploids of an interspecific hybrid or from a cross between autotetraploids of the two species.

3628 *Quadling, C. Mutation in phytopathogenic bacteria: studies on* Xanthomonas phaseoli. (*p. 315*).

Suggestions are made concerning the use of mutant pathogens in investigation of bacterial diseases of plants. Mutants of *X. phaseoli* were obtained by orthodox selective methods and by ultraviolet irradiation. Various degrees of virulence were found amongst the mutants; the observed virulence was a function of the method of testing.

3629 *Rajhathy, T. & Morrison, J. W. Cytogenetic studies in the genus* Avena. (*p. 317*).

The morphology of oat chromosomes is described and a classification into genomes is attempted [cf. XXIX, 3760]. Indications of allopolyploidy have been obtained. Interspecific hybridization has been carried out. Chromosome pairing in colchicine-induced allopolyploids, hybrids and segregated forms is described.

3630 *Rajkova, H. A. Spontaneous hybridization and grass hybrids in the Pamirs.* (*pp. 317–18*).

The Gramineae provide many examples of the formation of species by hybridization. In the Hordeeae, there are *Elymus divaricatus* (*Agropyron trichophorum* x *E. angustus*) and *A. tenerum* x *Clinelymus nutans* which was found at the Pamir Biological Station. In the Eastern Pamirs, spontaneous sterile hybrids of *Hordeum turkestanicum* with *C. nutans* are often found and less frequently crosses of *H. brevisubulatum* with *C. nutans*; the parent species are in contact in this region. Also these hybrids were often produced in mixed crops at the biological station. Hybridization is said to be facilitated by changed conditions and peculiarities of floral biology; the two *Hordeum* species are obligatory cross pollinators and *C. nutans* is a self pollinator. It is thought that a study of the many different hybrids in the Pamirs would throw light on species formation.

3631 *Raper, J. R. Parasexual phenomena in Basidiomycetes.* (*pp. 318–19*).

Recent studies have indicated that somatic recombination between the compatible components of dicaryons is a regularly occurring feature of this highly specialized type of heterocaryon. Some puzzling phenomena are said to have found an explanation in recombination in the vegetative dicaryotic mycelium. For example, in the Hymenomycetes, there are the reaction between dicaryons and homocaryons in incompatible combinations (illegitimate Bullar phenomenon) and the occurrence of new, unexpected genotypes in the corresponding compatible combinations (the legitimate Bullar phenomenon) and in the Uredinales, there is the appearance of recombinant mycelial types in mixed dicaryotic infections. The complex intermycelial reactions used to detect somatic recombination are imperfectly understood; the intramycelial details of recombination have not been studied and are known only by inference. Direct examination of the vegetative dicaryon has revealed that somatic recombination is highly variable, occurs in frequencies of up to 3% of the dicaryotic nuclear population and yields nuclear products indistinguishable from those produced in meiosis. It seems that cryptic sexual processes may be of considerable importance in the biology of higher fungi.

3632 *Roper, J. A. Genetic recombination as a factor in modifying antibiotic production.* (*p. 332*).

Strain improvement based solely on mutation is strictly limited but the discovery of parasexual processes [cf. 3633] in the fungi has made possible the determination of the genetical control of antibiotic synthesis and the planned breeding of improved strains.

3633 *Roper, J. A. The steps in the parasexual cycle.* (*pp. 332–33*).

"Parasexual is a term introduced by Pontecorvo to describe those processes of genetic recombination which do not take place through the standard sexual cycle of alternating nuclear

fusion and meiosis. In certain, perhaps all, filamentous fungi, rare but regular fusions of pairs of haploid nuclei occur in the mycelium. The resulting diploid nuclei are relatively stable and their descendants may be included in conidia. When, in a heterokaryon, genetically unlike nuclei fuse, the resulting heterozygous diploid conidia can, by appropriate techniques, be readily selected and diploid strains established. During the growth of diploid strains the nuclei undergo rare but regular processes which result in recombination and segregation. Extensive comparisons in *Aspergillus nidulans* between the results of the sexual and parasexual cycles have clarified the parasexual mechanisms. The fungal parasexual cycle (heterokaryon formation, fusion of genetically unlike nuclei, mitotic crossing-over, haploidisation) provides a substitute for the sexual cycle in certain imperfect fungi. The parasexual cycle has implications for imperfect species in nature; in the laboratory the cycle can be used both to study the genetics of imperfect fungi and as an additional tool in the genetics of those species with a perfect stage."

3634 *Sackston, W. E. Sunflower rust* (Puccinia helianthi) *in the Americas.* (*p. 338*).
Two nonallelic factors for resistance to rust obtained from *Helianthus annuus* from Texas have been incorporated into sunflower lines both singly and in combination. Other strains of *H. annuus* and *H. argophyllus* have different resistance factors. Using the Texas resistance factors, four pathogenically distinct rust phenotypes were differentiated. All these rust phenotypes were found in Manitoba, two were obtained from Argentina and Uruguay and one from Peru; a phenotype from Argentina was further differentiated using resistance factors from *H. argophyllus*. Virulent rusts were also found in British Columbia and Mexico. Perennial *Helianthus* species in North America and *Wedelia* species in South America may play an important part in spreading rust and in the production of new pathogenic strains.

3635 *Sadasivan, T. S.* In vivo *changes in* Fusarium *wilted cotton.* (*pp. 338–39*).
Symptoms observed in infected diploid cotton are described. Cystine appeared to be a resistance factor in tetraploid cotton. Diploid cottons had more pectin than tetraploids in the roots, thereby providing a substrate for the action of pectin methylesterase and polygalacturonase produced by *F. vasinfectum*.

3636 *Scheffer, R. P. Association of disease resistance with host metabolic activities.* (*p. 345*).
There is some circumstantial evidence that the resistance of tomato to *Fusarium* depends on active metabolism. Whilst the fungus disappears from plants growing under favourable conditions, it persists where conditions are unfavourable. Resistance may be destroyed by certain metabolic inhibitors. The dependence of resistance on active metabolism is also apparent in potatoes infected with *Phytophthora infestans*. Defence toxins may be mobilized by energy-requiring reactions from cells adjacent to the site of infection and phenolic compounds and polyphenolase activity may be involved. Narcotization of potato tissue prevents the accumulation of phenols and the expression of resistance. Some resistant tissues produce a nonspecific toxin, phytoalexin, after infection, the formation of this substance being prevented by treatments affecting metabolism. Also the formation of chlorogenic acid which is associated with resistance to some diseases depends on active metabolism.

3637 *Schönbach, H. Die Variation der Frostresistenz in "einheimischen" Beständen der grünen Douglasie* (Pseudotsuga menziesii (*Mirb.*) *Franco*). [*The variation in frost resistance in "indigenous" stands of the green Douglas fir* (Ps. menziesii [*Mirb.*] *Franco*)]. (*pp. 347–48*).
One-year-old progenies of open-pollinated trees selected in the Tharandter Wald have shown marked differences in resistance to frost; some plants were resistant to both spring and winter frost. There were some differences in form between resistant and susceptible plants.

3638 *Schröck, O. The importance of physiological age for the methods of forest plant breeding.* (*p. 349*).
Changes occurring with advancing physiological age make it difficult to assess attributes such as growth increment, ability to regenerate and morphological characters. The effect of physiological age was studied in cuttings of a tree of *Populus* x *berolinensis*. Observations on progeny of crosses with aspen showed "that plants growing very rapidly during the first year of vegetation are usually fast growing in the early stage". These plants flowered earlier than those which grew more slowly during the first year, although these last mentioned trees may have almost caught up with the others in growth after seven years. Fast growing in the "early stage" is associated with early culmination of

growth and early inception of flowering. By continuous measurement of annual shoot growth, it is possible to determine the rate of growth during the "early stage".

3639 *Schubert, B. G. Some aspects of the taxonomy of American Dioscoreas.* (*p. 349*).

Characters of taxonomic importance are listed. The New Crops Research Branch of the US Department of Agriculture has sponsored collecting and propagation of *Dioscorea* species. The divergent tuber characters of species with similar floral characteristics are noted.

3640 *Schulz-Schaeffer, J. The cytotaxonomic significance of the satellite chromosomes in the genus* Bromus *L.* (*p. 350*).

Twenty-nine species in the sections *Bromopsis*, *Bromium* and *Ceratochloa* were studied and 17 types of satellite chromosomes were found. There are SAT chromosomes typical for each section. *B. secalinus*, *B. commutatus* and *B. oxyodon* may be hybrids between *Bromopsis* and *Bromium*. *B. sitchensis* ($2n = 56$) is thought to be a hybrid between *Ceratochloa* and *Bromium*. The SAT chromosomes of *Ceratochloa* differ from those of the other sections in having very short satellited arms. The significance of an analysis of SAT chromosomes for the investigation of intergeneric relationships is discussed.

3641 *Sharma, K. D. Stimulating effect of irradiation on buckwheat*—Fagopyrum esculentum (*Moench*)—*Silver Hull variety.* (*p. 356*).

Samples of seeds were irradiated with X rays (5000–40,000 r.) or with thermal neutrons ($8{\cdot}73 \times 10^{12}$—$5{\cdot}87 \times 10^{13}$/cm.$^2$/sec.). From observations on the $R_1$ generation it appeared that doses of 5000 and 10,000 r. X-rays had a stimulating effect on speed of germination and subsequent development and on height. Similar but less marked results were obtained with the lowest dose of thermal neutrons. Higher doses of irradiation had a retarding effect on development. In the $R_2$ generation obtained by selfing $F_1$ plants similar results were obtained. It is suggested that polydirectional mutations were induced by the treatments.

3642 *Shay, J. R. & Brown, A. G. Concepts and problems in disease resistance in tree fruits.* (*pp. 357–58*).

The problems of disease-resistance research on tree fruits are similar to those of annual crops propagated by seed. The occurrence of new races of pathogens attacking previously resistant varieties is particularly important since varieties are not easily changed. Using all available sources of resistance in breeding and continuous testing of host resistances over a wide geographical area help to safeguard against this occurrence. Other special problems are also mentioned.

3643 *Shult, E. E. Tetrad analysis in yeasts and other fungi.* (*p. 360*).

"Modern genetic theory (which provides the mode of inference) in studies of segregation and linkage has provided information concerning (*a*) the location of genes and (*b*) the manner in which crossing-over occurs. Tetrad analysis of the lower plants, however, is now being exploited because the data from tetrad analysis possess more degrees of freedom, as well as other advantages, over conventional Mendelian single strand analysis. Tetrad analysis provides additional information concerning (1) three independent criteria for ordering genes (compared to one criterion by single strand analysis) providing a higher level of certainty concerning the demonstration of linear and non-linear gene orders than is available in bacterial or viral genetics, and (2) methods for the location of the centromere not possible with single strand analysis. Tetrad analysis also provides (1) a complete separation between chromatid and chromosomal interference between regions and (2) a means of detecting interference within a single region. Tetrad analysis also provides a unique type of hybrid whose total genome is derived from a single meiosis (e.g., the intra-ascal hybrid). The latter is useful for the direct genetic study of single translocations and inversions and for the study of inheritable preferentially segregating sites (affinity)."

3644 *Skalinska, M. Cytology and mode of reproduction of some endemic species in relation to their age.* (*p. 365*).

*Poa granitica* and *P. nobilis*, both oreophytes of the High Tatra, are thought to be of rather recent origin. They have variable, high aneuploid chromosome numbers; the former reproduces by apospory and the latter is viviparous.

3645 *Skinner, F. L. Tree breeding at Dropmore.* (*p. 366*).

A review is given of breeding of fast-growing and disease and insect-resistant varieties of hybrid poplars and limes.

3646 *Skok, J. Relationship of boron nutrition to X-irradiation induced genetic effects in sunflower.* (*p. 366*).

Withholding boron from seedlings for short intervals before X irradiation reduced the occurrence of certain genetic effects such as leaf abnormalities in the following generation.

3647 *Smetannikova, A. I. A comparative ecologico-physiological investigation of medick under the conditions of the north-west of the U.S.S.R.* (*p. 367*).

*Medicago sativa* from the North Caucasus, *M. tianschanica* (wild and cultivated forms), *M. falcata* from Yakutia and a variegated hybrid, Severnaja 69 [Northern 69] were studied in the Karelian Isthmus. Data on physiological characteristics under adverse conditions were obtained, differences between species and strains being observed. Differences in certain physiological characters such as the temperature of protein coagulation persisted for several years; these characters were found to change during growth and development. The extension of *Medicago* to northern regions is said to involve an abrupt increase in the content and metabolic significance of soluble carbohydrates and hemicellulose. The cultivation of the species tested in the Karelian Isthmus is promising for hay and seed production.

3648 *Smith, C. E.* (*Jun.*). *The species of* Cedrela (*Meliaceae*). (*p. 368*).

The genus is thought to include only seven species. *C. mexicana* is merged into *C. odorata*; *C. fissilis* is restricted to the pubescent-leaved form of southern South America; and *C. angustifolia* is applied to the puberulent Central and South American species which had formerly been placed in *C. fissilis* or split into numerous species.

3649 *Snyder, W. C. Heterokaryosis as a natural phenomenon.* (*p. 371*).

Some general remarks are made on this phenomenon.

3650 *Sparrow, A. H., Sparrow, R. C. & Pond, V. Sterile culture of excised anthers of* Trillium erectum. (*pp. 373–74*).

[Cf. 89].

3651 *Squillace, A. E. & Dorman, K. W. Selective breeding of slash pine for high oleoresin yield and other characters.* (*p. 375*).

Thirteen-year old progenies from controlled and open pollinations of *Pinus elliottii* have been tested for resin yielding capacity; this was found to be an inherited character and estimates were made of heritability. Also the theoretical degree of improvement possible through (1) continuous selection and breeding and (2) progressive establishment of seed production areas were estimated. Seed orchards are being established using vegetative propagules of selected first-generation progenies of tested parents. Variation and inheritance of resin viscosity, resin exudation pressure, tracheid length and stem deformities have been investigated.

3652 *Stanley, R. G. Metabolic studies of pine pollen and their potential application in tree breeding.* (*p. 376*).

The various pathways by which carbohydrates are metabolized and the capacity of pollen to utilize glucose under varying oxygen levels have been investigated. Also the mechanism of the stimulation of pollen-tube growth by boron has been studied with radioactive glucose. Subcellular units of pollen cytoplasm are being isolated and their contributions to the genetic potential of the progeny investigated. Attempts are being made to develop field techniques of pollen treatment for facilitating fertilization or embryonic development by modification of the metabolism.

3653 *Staudt, G. Cytotaxonomy and phylogenetic relationships in the genus* Fragaria. (*p. 377*).

Eight diploid species are known; they differ in their morphological characters and geographical distribution, with the exception of *F. viridis* and *F. nubicola* which may be closely related. The diploid species are only crossed with difficulty and the hybrids show reduced fertility. Since meiotic chromosome pairing is almost normal, the low fertility may be the result of cryptic structural differences between otherwise homologous chromosomes or cytoplasmic differences. The *vesca* complex occurs in Eurasia and North America and the eastern American ssp. *americana* resembles the Eurasiatic ssp. *vesca* more than the ssp. *californica* and *bracteata* from west America. It is suggested that central and east Asia may be a centre of diversity and a centre of origin for many polyploid species and especially the tetraploids. *F. mandschurica*, recently discovered in Manchuria, is probably an ancestor of the tetraploid *F. orientalis*. Tetraploids cross easily and their progeny is completely fertile. *F. moschata*, distributed in Europe, is the only hexaploid; it may have originated in Europe or Asia from a cross of *F. vesca* with either *F. nubicola* or *F. viridis*, the two last mentioned species having characters similar to those of *F. moschata*. Octoploids have only been found in America. Since they cannot have originated from the diploid species in America, they must have come from East Asia, where characters corresponding to those of the octoploids are found in some species such as *F. iinumae* in Japan and *F. daltoniana* in the Himalayas. Octoploids are hybridized easily

and their geographical distribution and morphological characters indicate that they have arisen polyphyletically.

3654 *Stauffer, J. F. Induced mutation in penicillin biosynthesis.* (*pp. 377–78*).

Work carried out at the University of Wisconsin is described. A tenfold increase in the synthetic capacity of *Penicillium chrysogenum* has been attained; ultraviolet radiation, nitrogen mustard and methyl-bis (β-chloroethyl)amine have been successfully used as mutagenic agents and spontaneous mutants have also contributed to the improvement of the Wisconsin family of strains. Yellow pigment was eliminated in a single step.

3655 *Stebbins, G. L. & Crampton, B. A suggested classification of grass genera of north America based on modern criteria.* (*pp. 378–79*).

A revision of concepts in grass phylogeny is thought to be necessary. The revision should be based on many characters in addition to spikelet morphology since resemblances in spikelet characters are often due to parallel or convergent evolution. North American genera have been examined and of the 185 genera listed by Hitchcock and Chase as occurring in the USA, 59 have been reclassified into different tribes. A number of additional tribes are recognized.

3656 *Stebbins, G. L. Biosystematics and evolution: a recapitulation of our present position.* (*p. 379*).

"The modern approach to problems of taxonomy in relation to evolution is based largely upon the development of the chromosomal theory of heredity in its broadest sense and the application of principles developed from this theory through quantitative observations and descriptions supplemented by experiments under conditions which combine a certain degree of control of environmental factors with an approach as nearly as possible to environmental conditions. The basic axiom for all workers in this field is that knowledge about evolutionary relationships can be obtained only by a synthesis of evidence from every possible field of endeavor, and that over-emphasis of evidence from any particular field will amost certainly lead to erroneous conclusions. The data and conclusions reported by the previous speakers are examined in the light of these postulates."

3657 *Stein, O. L. & Steffensen, D. M. The distribution of radiation-induced genetic markers in leaves of* Zea *and its relation to the activity of the shoot apex.* (*p. 381*).

In this study of the shoot apex, maize embryos heterozygous for $yg_2$ were irradiated with X rays [cf. 360]. The distribution of the yellow sectors produced by the loss of the dominant gene was studied. "The results indicate that (1) the shoot apex of corn ordinarily has within itself the meristematic capital for about three future leaves, and (2) once these cells have been worked out of the apex by cell division the remaining meristematic cells at saturation doses will carry the maximum load of genetic damage that a cell can carry and still continue normal processes."

3658 *Stroun, M. & Cortesi, R. Multiple fertilization in* Mirabilis jalapa *L.* (*p. 385*).

A white variety fertilized with pollen from a yellow variety gave a yellow $F_1$ hybrid, a white plant pollinated by a red had red progeny, and a yellow pollinated by a red gave an orange-red hybrid. The white variety pollinated with pollen from both red and yellow plants also gave an orange-red hybrid. In the $F_2$ generation, the simple crosses showed normal segregation between the two parental types. The $F_2$ originating from the bipaternal cross segregated into both the male parent colours and the seed parent type. It is concluded that the possibility of the ovular cytoplasm, the embryo-sac cells and the surrounding cells which absorbed the additional spermatozoids having some effect on the genome should be considered.

3659 *Tomiyama, K. Snow blight of winter cereals in Japan.* (*pp. 400–01*).

According to Japanese investigations, the resistance of wheat to *Typhula* is associated with the accumulation of reserves (unspecified) and the development and maturation of cell walls and wall thickening in leaves during the autumn.

3660 *Tsunewaki, K. & Jenkins, B. C. Monosomic and conventional analyses of genes in common wheat.* (*p. 404*).

Seven varieties of common wheat were crossed with each of 21 monosomic lines of Chinese Spring and diallel crosses were made among the eight varieties; the $F_1$ and the $F_2$ of these crosses were studied in respect of the inheritance of three characters. Results obtained by monosomic and conventional analyses were in complete agreement; the monosomic analysis provided critical information on the number and location of genes involved and the conventional analysis gave information on gene interaction. Growth habit was found to be controlled by three allelic series $Sg_1$, $Sg_2$ and *Lm* on chromosomes XVIII, IX and XX respectively. Seven allelic series, *Hd*, $B_1$, $B_2$, $A_1$, $A_7$, $A_8$ and $A_9$ on chromosomes VIII, IX, X, II, I, III and XI

respectively are responsible for awning. Hairy glume is controlled by *Hg* on chromosome XIV. Genotypes have been assigned to each variety.

3661 *Tucker, J. M. A review of hybridization in north American oaks.* (*pp. 404–05*).

More than 100 interspecific hybrids have been recorded in North America and many others are known. Natural hybridization appears to be entirely within subgenera, although Pjatnitskij has reported experimental crosses between subgenera. Hybridization between species of all degrees of relationship is known within the subgenera *Lepidobalanus* and *Erythrobalanus.* Factors limiting hybridization, the biological results of hybridization and taxonomic problems are discussed.

3662 *Ullstrup, A. J. Bacterial stripe, an unusual disease of maize.* (*p. 406*).

Inbred lines inoculated in the field in Indiana showed marked differences in relative resistance to this disease, believed to be caused by *Pseudomonas andropogonis.*

3663 *Vaartaja, O. Photoperiodic ecotypes in trees.* (*pp. 407–08*).

Many tree species have been found to consist of distinct populations differing in their reaction to photoperiod.

3664 *Viglierchio, D. R. Susceptibility of cross-grafts of* Beta *species to* Heterodera schachtii. (*p. 416*).

Cross grafting was carried out between susceptible and resistant plants. Counts of the numbers of nematodes developing on the root systems of grafted and ungrafted plants showed that the reaction of the rootstocks was not affected by the graft. It is concluded that the expression of resistance or susceptibility is inherent in the roots and the translocation of an active factor from stem or leaves is not involved.

3665 *Wada, B. & Sâto, S. Electron microscopic studies of the plant mitotic spindle.* (*p. 418*).

Most of the information given here has already been summarized [cf. XXIX, 3465]. The cell plate appears from the time of its initiation "as doubled layers, crossing vertically to the unit fibrils of the phragmoplast, and showing high density to the electron beam." Each layer has a thickness of 250 to 1000 Å and the distance between them measures 2500 to 4000 Å.

3666 *Walker, J. C. Disease resistance in crucifers.* (*p. 420*).

The resistance of cabbage to yellows is built up by mass selection for modifying genes which have an additive effect and restrict the expression of susceptibility which is controlled by a single recessive gene. A single dominant gene conferring more complete resistance is also being incorporated into commercial varieties. It occurs in wild cabbage, Brussels sprouts, kohl rabi and probably in other cultivated forms of *Brassica oleracea*; this gene is effective against the four known races of *Fusarium oxysporum* f. *conglutinans.* Lines of radish resistant to the cabbage and radish races of the pathogen have been obtained by mass selection. The resistance of cabbage to turnip mosaic virus and cauliflower mosaic virus is multigenic and incompletely dominant. Lines of cabbage resistant to *Plasmodiophora brassicae* are being developed; distinct pathogenic races of the fungus exist.

3667 *Wettstein, D. von. Nuclear and cytoplasmic factors in development of chloroplast structure and function.* (*p. 428*).

Environmental and genetic factors have been found to block the normal development of plastid structures in various ways; there may be failure in pigment synthesis or in the incorporation of pigment into plastid structures. The effect of gene mutations on the development of chloroplasts has been studied in barley and compared to the effect of plasmatically inherited factors in *Humulus* and *Nicotiana.*

3668 *Wimber, D. E. Chromosome fragmentation in* Tradescantia paludosa *root tips produced by tritium-labeled thymidine.* (*pp. 432–33*).

[Cf. XXIX, 3479 and XXX, 965].

3669 *Withner, C. L. Phytic acid - phosphate relationships in inbred and hybrid corn.* (*p. 433*).

In an investigation of heterosis, the rates at which seed reserves are mobilized for combination with compounds involved in energy release and growth are being investigated. Phytase activity has been found to be higher in hybrids than in inbred lines, and also the hybrids have a greater relative rate of phosphate translocation from endosperm to seedling, inorganic phosphate increasing more rapidly during germination.

3670 *Woods, P. S. Ribonucleic acid metabolism and function of the cell nucleus.* (*pp. 435–36*).

RNA metabolism in root-tip cells of *Vicia faba* was studied using tritium-labelled cytidine [cf. XXIX, 1139]. With continuous treatment, radioactivity appeared first in the nucleolus and later also in the cytoplasm. When the treatment lasted for a period such that only

the nucleolus was labelled, the label moved into the cytoplasm during further growth in a non-labelled medium. These results are discussed in relation to hypotheses suggesting that RNA is the carrier of genetic specificity from the DNA of the chromosomal gene to sites of protein synthesis.

3671 *Wright, J. W. Seed orchards or test plantings?* (*p. 436*).
Selection can usually be continued for several generations without diminishing results. Long-term selection programmes involve progeny testing and the question has arisen as to whether the progeny tests can be used as interim seed orchards for producing seed of the highest quality attainable at the time. It is thought that this is permissible for most genetic situations. When variance is additive, trees pollinated by their genetic equals are expected to yield progeny equal to themselves and the use of special clonal seed orchards would provide no genetic gain or improvement in seed yield. Test plantations are superior to special orchards in producing genetically improved seed when two-parent progeny testing is used.

3672 *Zobel, B. J. Juvenile wood in loblolly pine* (Pinus taeda). (*p. 443*).
Wood near the pith differs considerably from that growing further out. This juvenile core is of importance in genetic studies; it can be used for predicting the wood characteristics of the mature tree.

3673 *D'Oliveira, B. & Rodrigues, C. J.* (*Jun.*). *The coffee rusts.* (*p. 9*).
[Cf. 2999].

3674 *Du Buy, H. G. & Woods, M. W. Segregation of cytoplasmic particles in green plants.* (*pp. 9–10*).
It appears that cellular constituents such as plastids resemble viruses in being capable of self duplication and mutation. The nuclear control of mitochondrial or plastid modification is considered to be permissive and a gene allowing such mutation has been demonstrated in *Nepeta*. Mitochondria contain ribose nucleic acid which is presumably a prerequisite for their autonomous inheritance. The mutation spectrum extends from mitochondria capable of forming nearly normal plastids to those incapable of developing into plastids. Mitochondria appear to carry enzyme systems and many of the mutant forms have marked effects on cell growth and differentiation. "It is suggested that continued chondriogene mutation, and intraplasmatic natural selection of the mutant mitochondrial derivatives, could lead to the evolution of ribose nucleic acid - containing viruses."

3675 *Patau, K. & Nirmal, K. D. Induced cell reproduction in differentiated tissue.* (*pp. 27–28*).
DNA doubling occurred in some nuclei when tobacco pith was cultured on modified White's medium; the addition of kinetin increased the frequency of doubling. The addition of indole-3-acetic acid (IAA) alone increased DNA doubling and initiated mitoses and also cytocineses for a limited time. The DNA doublings, mitoses and cytocineses only continued to occur at a relatively high rate when both kinetin and IAA were added. Not all the nuclei entering mitosis had synthesized DNA in the culture. Nuclei with 4C DNA either entered a diploid mitosis or doubled their DNA content and then underwent a tetraploid mitosis. It seemed that repeated divisions leading to patches of meristematic cells only occurred in cells with diploid mitoses.

3676 *Riker, A. J. & Patton, R. J. Breeding trees for disease resistance.* (*p. 30*).
Breeding for disease resistance using techniques employed with other crops has been carried out successfully with trees. The nature of resistance and its inheritance are often complex. Trees that appear to be resistant in one set of conditions may be susceptible in another. Progeny tests are necessary in testing for ability to transmit resistance through seed. When clones resistant to a particular disease are multiplied vegetatively for planting stock, it is necessary to have at least 12 different clones in case some of the clones are susceptible to other diseases.

3677 *Steffensen, D. Structure and stability of chromosomes in the irradiated cell.* (*pp. 36–37*).
Electron-microscope studies have shown that the chromosomes of higher plants are multi-stranded structures. The aggregation and orientation of macromolecules into chromosomes are explained with reference to different kinds of secondary chemical bonds. Hydrogen bonds, ionic bonds and metal complexes are the most important cohesive forces. There is some information available on the roll of calcium in chromosome stabilization. The restitution of broken chromosomes to the original state is said to occur when chromosome movement is retarded or stopped; chromosome exchange is enhanced by agents which increase chromosome movement.

3678 *Whitaker, T. W. Biosystematics of the cultivated* Cucurbita. (*p. 40*).
The five cultivated species of *Cucurbita, C. pepo, C. mixta, C. moschata, C. maxima* and *C. ficifolia,* all have $2n = 20$. These species show marked parallel variation in vegetative and reproductive structures. There is some archeological evidence indicating that each species has developed sterility barriers enabling it to maintain its identity for at least 5000 years under cultivation. No natural hybrids between the species have been reported. It is possible to obtain fruits from reciprocal matings of most of these species but the number of fruits set varies considerably with the species and cultivars used. Most of the fruits contain few if any fertile seeds and when $F_1$ plants develop they are usually sterile in crosses with each parent.

3679 *Wolff, S. Studies on the biochemical nature of intergenic mutations.* (*pp. 40–41*).
Reference is made to studies carried out with *Vicia faba* [cf. XXIX, 1138].

3680 Bandlow, G.
Beiträge der Genetik zur Entwicklung landwirtschaftlicher Kulturpflanzen. **(Contributions of genetics to the development of agricultural crop plants).**
Forsch. Fortschr. 1960 : **34** : 131–36.
In this general article, examples of gene, chromosome and genome mutations which have proved of value in crop plants are given. Mention is also made of the use of interspecific and intergeneric crosses, the occurrence of cytoplasmic inheritance and studies of population genetics and environmental effects.

3681 **Annual Report of the Plant Breeding Institute, Cambridge, 1958/59** : Pp. viii + 69.
This is the first published report of the institute. It includes a feature article giving a general account of the development of the work of the Institute since its establishment in 1952 as a research organization with its own governing body.
**Wheat.** Promising high-yielding selections were obtained from hybridization programmes involving many commercial varieties. Confirming evidence from diallel cross analysis, Yeoman x Cappelle Desprez has given a number of interesting lines. Genotype-environment interaction with respect to yield is being studied in a 7 x 7 diallel cross.
$F_1$ hybrids were grown of Cappelle Desprez with four interspecific amphiploids: (1) *Triticum durum* 'Kubanka' [wheat from Kuban'] x *T. thaoudar*, (2) *T. pyramidale* x *T. aegilipoides*, (3) *T. durum* 'Indian Runner' x *T. aegilopoides*, and (4) *T. turgidum* 'Rampton Rivett' x *T. thaoudar*. All plants of Cappelle Desprez x (1) died at the 4-leaf stage. Plants of Cappelle Desprez x (2) established well, tillered strongly during winter and early spring but died in April. Cappelle Desprez x (3) segregated for the latter type of lethality, six dying and seven forming strong plants. All plants of Cappelle Desprez x (4) grew vigorously throughout the season but were very susceptible to yellow rust.
Progress in breeding for resistance to yellow rust, powdery mildew, loose smut, eyespot (*Cercosporella herpotrichoides*) and black stem rust is reported. Several hybrids were equal to Cappelle Desprez in eyespot resistance, although no variety was previously known with resistance as good as the latter. Breeding for short stiff straw using the Australian variety Ghirka is in progress.
A programme to build up a monosomic set in Cappelle Desprez is under way. A complete set of monosomic $F_1$ plants of Cappelle Desprez x Chinese Spring was grown, and a first back cross to Cappelle Desprez was made in each line. Progress in the investigation and exploitation of the genetic regulation of meiosis [cf. XXIX, 3644 and XXX, 966], studies on alien chromosome addition and substitution lines [cf. XXIX, 40 and 268], and the use of X-ray induced translocations in the transfer of useful genes from rye to wheat chromosomes are reported. Translocations of rye chromosome II material carrying disease resistance to wheat chromosomes have been made, but the alterations are still to be evaluated in terms of their genetic effects.
**Oats.** Two provisionally recommended hybrids are CA127 No. 8, which is a selection from Grey Winter x S172, and CA148 No. 20, a selection from a complex cross involving an Argentine spring oat and three varieties of the Grey Winter type. Both have short stiff straw and white grain. CA127 No. 8 is resistant to stem eelworm and is more winter hardy than CA148 No. 20; the latter however is the higher yielder. From an incomplete diallel series, crosses suitable for developing lines resistant to mildew and stem eelworm are being sought. Attempts are being made to transfer to commercial varieties the mildew resistance of two forms of the wild species *Avena ludoviciana*. A number of lines resistant to frit fly (*Oscinella frit*) have been produced by crossing the resistant Summer [cf. XXIX, 1444] with Blenda. A survey is being made of reaction to frit fly in a large

number of varieties and selections of diploid, tetraploid and hexaploid species.
Crosses of stiff-strawed Blenda with other varieties to transfer this character are reported. Blenda x Glasnevin Success has yielded lines particularly suited to high rainfall conditions.
**Maize.** Pollen from plants dominant for desired endosperm characters was soaked for periods of up to 1 hr. in various mutagenic substances and used to fertilize more than 600 inflorescences of plants recessive for the desired characters. The resulting ears are being examined.
**Barley.** Breeding for powdery-mildew resistance, winter hardiness and stiff straw was continued.
A short-strawed, X-ray induced mutant of Proctor was crossed with Rika and Domen to investigate the inheritance of the mutation and its expression in different genetic backgrounds. $F_2$ plants from both crosses were graded for height, and samples of each group were sown for comparison in the $F_3$. In the cross with Rika the mutant type could be clearly distinguished both in the pure-breeding and the segregating lines and was allied with the $F_2$ plant-height grading. In the cross with Domen however no such clear distinction was apparent, but the variation between lines was more strongly marked, ranging from normal *nutans* to extreme *erectoides* types.
X-ray induced mutants of the variety Earl were mostly small, poorly tillering, partially sterile plants and no useful mutants were found. Because the variation was smaller than had been expected from previous work on Proctor, the radiation sensitivities and mutation spectra of Earl, Proctor and Bonus are being compared. Soaked seed was sown in August 1959 after receiving 850 r. X irradiation, and the $X_2$ is to be sown in 1960. Already more plants of Earl have died than of the other two, and Bonus is now beginning to show harmful effects; Proctor is the least affected.
Investigations into maturity-yield relationships and the genetic basis of different types of resistance to *Erysiphe graminis* are being made. The association of flowering habit with reaction to *Ustilago nuda* is being studied.
**Grasses.** Progress in the selection of lines of *Dactylis glomerata*, *Festuca arundinacea* and *Phleum pratense* suitable for the dry conditions of south-east England is reported. From a collection of *Secale* species under observation, one form, *S. montanum* '26', has been retained for further study since it withstands frequent cutting and during the drought of 1959 was the only species to remain completely green and continue growth.
**Lucerne.** Varieties derived by crossing wild lucerne with du Puits and back crossing once or twice to du Puits are under observation. A promising hybrid has been selected from *Medicago falcata* x du Puits, back crossed twice to du Puits. A similar hybrid based on a Persian wild form [cf. XXVIII, 4306] has been discarded.
Pollinations were made in continuation of studies on flower-colour inheritance. A viable recessive form with transverse yellow bands on the leaves and designated "zebra" was crossed with a recessive white-flowered plant with the object of studying the joint segregation of these two characters.
**Red clover.** Breeding for resistance to stem eelworm and stem rot (*Sclerotinia trifoliorum*) is in progress.
**Potato.** Seedling families were grown of $BC_2$ and $BC_3$ back crosses to commercial varieties of material from *S. tuberosum* subsp. *andigenum* clones CPC 1673, 1685 and 1690 [cf. XXIX, 3597], which are resistant to the common biotype of *Heterodera rostochiensis*. Considerable progress was made and one clone, X55/33, has been sent for Scottish Registration Trials.
A detectable increase was noted in the frequency of a resistance-breaking eelworm biotype which can produce cysts on resistant material bred from CPC 1673, 1685 and 1690. The resistance of *S. vernei* to both the common and the resistance-breaking biotypes was found to be transmitted to some seedlings of the cross of autotetraploid *S. vernei* x Ulster Knight. Some clones of the triploid species *S. juzepczukii* appeared to be resistant to the biotype which can break resistance in *andigenum* clones but they were susceptible to the common biotype.
It was found that X irradiation produced plants with white tubers from parent tubers in which layers I and II have the factor for white-splashed colour, or in which layer I has the factor for full colour and layer II that for splashed colour. X rays did not produce white-tubered plants from parent tubers in which both layers have the factor for full colour. White tubers thus appear to be the result of differentiation of cells near the growing point in either layer I or II for nonproduction of pigment, and not of a differentiation of cells in the inner tissues as previously suggested [cf. 971].
**Sugar beet.** A new variety Cambro is reported. This variety is based on a stock of breeding lines designated KNB which were selected at the

institute for resistance to bolting. In the 1958 trials however its yield of roots was below the average of the control varieties although the sugar content was above the average. Bolting trials of KNB and KLT stocks showed the latter to be the more productive and equally resistant to bolting. Two other experimental varieties resistant to bolting were produced. One, designated Logie, was based entirely on lines selected at the Scottish Plant Breeding Station, while the other, Logie/KLT, was based on a mixture including lines from both breeding programmes. Attempts are being made to shorten the breeding cycle in nonbolting sugar beets. The results of trials determining tolerance to virus yellows are reported; TN58/5–12 and Q15/2R are said to have been outstanding. Crosses between normal and monogerm lines were sown in the $F_2$ and plants homozygous for the recessive monogerm character were transferred to the greenhouse for controlled pollination. Such plants were found to be more normal in the habit of growth of the flowering stem than the inbred material from which they were derived.

**Kale.** A short single-cross marrow-stem hybrid selected for stems of low woodiness was compared with a tall commercial stock. The short type (height 42 in.) gave 79% of the total dry-weight yield of the commercial variety (height 72 in.). Five per cent of the short type was wasted in the field compared with 23% of the commercial stock, so that the edible yield of the short hybrid was 98% of that of the commercial stock.

Six commercial varieties comprising green and purple marrow-stem types as well as thousand-head kales were compared with six single crosses with short stems in a leaf-retention experiment. The best of the marrow-stem hybrids were much leafier at each of three sampling dates than any of the marrow-stem varieties, and with better leaf retention, they approached the thousand-head varieties for yields of leaf; the stems of the short hybrids were less woody than those of any of the commercial stocks.

Breeding for a uniformly vigorous marrow-stem kale of medium height continued [cf. XXIX, 2013]. Single crosses were made in 1959 between different medium-height inbreds homozygous for self-incompatibility alleles to determine the best combinations for the production of high-yielding double-cross hybrids.

Breeding for a uniformly short, branching type of thousand-head kale combining late flowering with good winter hardiness has continued [cf. XXIX, 2013]. Late flowering appears to be genetically of more than one type. One type may be due to a single major gene which when heterozygous gives vigorous, extremely late-flowering plants but which when homozygous produces nonflowering plants. A second type, found as an inbred line, breeds true for late flowering. This line however is weak-growing and not very winter-hardy, and crosses from it have shown little improvement.

**Bean.** Studies on male sterility are in progress, attempts being made to detect linkage of this character with some easily distinguishable character to facilitate hand rogueing. Attempts at chemical emasculation with the gametocide FW–450 were unsuccessful. With the aim of increasing resistance to black fly (*Aphis fabae*) in the German variety Rastatt, crosses of this variety with English spring beans were effected. Plants of *Vicia faba* and the aphid-resistant *V. narbonensis* were irradiated with 250 and 500 rads from a $Co^{60}$ source in an attempt to overcome the incompatibility between the species. Over 1000 flowers were cross-pollinated but no viable seed was produced.

Berichte und Vorträge der Deutschen Akademie der Landwirtschaftswissenschaften zu Berlin. 4. Festsitzung und Wissenschaftliche Tagung 17–18. Oktober 1959 in Berlin. (**Proceedings and addresses at the German Academy of Agricultural Sciences, Berlin. 4th Jubilee Session and Scientific Meeting, 17-18 October 1959 in Berlin**). 1959 : No. 4 : Pp. 140.

The proceedings comprised progress reports and a number of special addresses dedicated to the Darwin Jubilee celebrated in 1959 to commemorate the publication of *The origin of species*. The progress reports contained references to a new polyploid sugar beet Multa, polyploid red clover, promising maize hybrids and nematode-resistant potato hybrids which are now under trial. Several new varieties of medicinal and horticultural plants have also been produced. The special addresses included the following.

3682 *Wundsch, H. H. Die Veränderung der Lebewesen durch natürliche Auslese und das Werk von Lamarck, Darwin und Haeckel in unserer Landwirtschaftswissenschaft.* (*Alteration of living organisms by natural selection and the work of Lamarck, Darwin and Haeckel in our agricultural science*). (*pp. 45–64*).

The speaker expressed the viewpoint that

Darwin's great contribution was in presenting natural selection as a mechanism for evolution rather than in originating the evolutionary principle itself. He submits that the expression *Kampf um's Dasein* is an incorrect translation of *struggle for life* (though Darwin's actual expression was *struggle for existence*), points to the consonance of Darwin's principles with those of dialectical materialism and of practical plant and animal breeders, and emphasizes that, after many vicissitudes, the Darwinian concept of selection as the basis of evolution is today more firmly entrenched than ever. One of Haeckel's greatest contributions is seen in his insistence on the application of Darwin's principles to practical breeding.

3683 *Becker, G. Darwin und die Pflanzenzüchtung.* (*Darwin and plant breeding*). (*pp. 99–113*).

The wide validity of Darwin's theory of evolution by natural selection is ascribed to the fact that he confined himself in the first place to a study of microevolution at a subspecific level, a virtue that is shared by the science of population genetics. Astonishment is expressed at the fact that plant-breeding methods are based principally on factorial genetics rather than on population genetics; it is pointed out that most wild plants are cross fertilized yet almost all breeding methods are based on pure lines: even the bulk-population method has as its aim the production of the maximum number of homozygous lines. Yet few if any good cultivars have originated from a pure line. Even with those cultivated plants that have remained cross fertilizers, such as maize, rye and sugar beet, breeding methods have aimed at the production of lines approaching as closely as possible to homozygosity. It is affirmed that hybrids from single crosses between inbred lines are never successful as cultivars and that successful maize hybrids were only produced when double crosses were introduced; and a double-cross hybrid is regarded as already a population. Induction of mutation and polyploidy in self-fertilized plants has also, it is claimed, failed to produce useful cultivars. The thesis is presented that a successful breeding method must be based on populations rather than on pure lines, selection for general combining ability being carried out continually. Self-pollinating cultivated plants should be restored to the condition of populations and to this end occasional plants that show a tendency towards cross pollination should be selected. Line mixtures should be made and subjected to selection in a range of ecologically different localities. Irradiated progenies and induced polyploids should be mixed in order to provide the possibility of favourable gene combinations to emerge in the population; the success of this last-named principle is illustrated by the triploid sugar beets, the superiority of which is thought to have nothing to do with triploidy being the optimum degree of ploidy; another example is the author's polyploid mint Polymentha, which exceeds the parents in yield and is resistant to *Puccinia menthae*. The superiority of most natural polyploids to the artificial ones is ascribed to their origin from the union of genically different gametes.

3684 Karner, L.
Ergebnisse der Sonderkulturen-Versuche des Jahres 1959. (**Results of the special crop trials of the year 1959**). VersErgebn. BundesVerAnst. alpenländ. Landw., Gumpenstein 1959 : No. 50 : Pp. 73. (Mimeographed).

Varietal trials of poppy, paprika and various vegetables in Austria are reported.

3685 Birecki, M.
(**Agricultural science in Poland**).
Vestn. sel'skohozjajstv. Nauk (Rep. agric. Sci.) 1959 : No. 6 : 108–16. [Russian].

Employing polyploidy, distant hybridization and other methods, Polish plant breeders have bred new improved varieties of cereals, leguminous forage plants, potato, sugar beet, oil plants and vegetables. One new sugar-beet variety is a polyploid.

3686 V Convegno annuale della Società Italiana di Genetica Agraria (Salice Terme - Pavia, 16–18 Giugno 1958). (**Fifth annual meeting of the Italian Society of Agricultural Genetics, Salice Terme - Pavia, 16-18 June, 1958**).
Genet. agr. 1960 : **11** : 311–60.

Verbatim reports are given of the opening speeches and the discussion following the addresses [cf. 1295–1310]. D'Amato and others referred to the use of gammexane in inducing polyploidy in the Gramineae, to the need for overcoming the competition between polyploid and diploid tissue and to specificity in the mutagenic action of colchicine, some genes in certain sorghum varieties being susceptible to its action while others are not. Gallarate gave an account of the Italian trials of sugar-beet varieties [cf. XXIX, 2910], which have shown the polyploids to be superior to most diploid

varieties in sugar yield; the proportion of polyploid varieties grown in Italy rose from 0·06 in 1953 to 19·55% in 1958. Flamini mentioned that chloroplast counts on 5000 specimens showed that the mean chloroplast number per cell was below 19 in diploid sugar beets, 20–26 in triploids and 28–48 in tetraploids but there was a certain amount of overlap between triploids and tetraploids in the range of 26–29. Scaramella-Petri and Donà dalle Rose confirmed the frequent difficulty of making accurate counts on sugar-beet root tips referred to by Bianchi [1298], a view with which D'Amato expressed some disagreement, and Beni pointed to the advantages of the method of counting the chromocentres. Wit stated that in mixtures of white clover and ryegrass the clover grew better with tetraploid ryegrass than with diploid, which, though having more fibre than the tetraploid, had a greater tendency to lodge; the tetraploids have proved more appetizing both to livestock and vermin, probably because of their greater sugar content. Speckmann referred to variations in the number of chromocentres in leaves of sugar beets, making the use of this method of determining chromosome number sometimes doubtful in validity. D'Amato gave details of his technique of Feulgen staining of graminaceous roots and mentioned some cases of chromosome mutants which, while maintaining the diploid number of chromosomes, have all the appearances of being polyploid; in other cases effects, such as fasciation, induced by irradiation are transmitted for one generation to the progeny and then disappear, for which reason the effects are thought to be the result of hormone action. Meletti stated that back crosses of Denti de Cani [1304] with *Triticum durum* 'Cappelli' had been made artificially but rarely occurred in nature owing to differences in flowering time; D'Amato pointed out that the Denti de Cani were amphidiploids and reflected the process by which the hexaploid wheats are supposed to have arisen in the first place. The papers presented on the third day included those by F. Nilsson on Polyploidy in *Ribes* [4290] and that of P. Montevecchi on wheat mutants [3787]. In connexion with the probable polyploid nature of *Ribes* spp. it was pointed out by Nilsson that the sterility of the hybrids between them was due more to difficulties of pollen germination than to meiotic disturbances. Duplicate genes were supposed to exist though they had not yet been demonstrated. Some doubt remained as to whether the polyploid forms of *Ribes* were superior or inferior in fruit quality. It was recognized that the section *Coreosma* is composite and should probably be divided into several sections; in crosses of *R. nigrum* x *R. sanguineum*, segregation for fertility occurred in advanced generations. Montevecchi gave details of various methods she had used for colchicine treatment. Mariani stated that some inbred maize lines isolated from Italian populations were possessed of drought resistance and when crossed with American single crosses gave better hybrids than the American double crosses. Several speakers expressed the opinion that the inbreds retained a considerable degree of heterozygosity even after ten or more generations of inbreeding.

3687 Zaharčenko, S. A.
**(The Puškin laboratories of the Institute of Plant Industry).**
Trud. priklad. Bot. Genet. Selekc., Sborn. Puškinskih Lab. (Bull. appl. Bot. Gen. Pl.-Breed. Works of Puškin Lab.) 1958 : No. 1 : 5–9. [Russian].

An account is given of the main lines of investigation pursued by the laboratories; some of the new varieties produced there include improved varieties of cabbage, potato, wheat and oats.

3688 B., T.
**(A conference on utilizing hybridization in agriculture).**
Vestn. sel'skohozjajstv. Nauk (Rep. agric. Sci.) 1959 : No. 6 : 148–49. [Russian].

A report on a conference held at Har'kov in March 1959 is given. The papers dealing with plant breeding included: the use of heterosis, by P. M. Žukovskij; the theory and practice of maize breeding, by B. P. Sokolov; the inadequacies of breeding research by V. Ja. Jur'ev; the breeding of high-yielding wheat by F. G. Kiričenko; and the breeding of monogerm and other new forms of sugar beet by I. F. Buzanov.

3689 Lysenko, T. D.
**(Laureates of Lenin prizes. Outstanding breeders—Mičurinists).**
Agrobiologia (Agrobiology) 1959 : No. 3 : 323–24. [Russian].

Lenin prizes have been awarded to Kiričenko and Luk'janenko for breeding improved varieties of winter wheat at Odessa and Krasnodar respectively. The new varieties from Odessa include a hard winter wheat and those from Krasnodar are resistant to rust. A similar prize has been awarded to Pustovoit for breeding sunflowers resistant to *Orobanche* and with double the oil content of the older varieties.

3690 **(Agricultural science in the Azerbaijan SSR).**
Hlopkovodstvo (Cotton Growing) 1959 : No. 6 : 63–64. [Russian].
Mention is made of new lucerne varieties and the cotton cultivars 2306 and 2421 which were bred at the Azerbaijan Cotton Institute. The lucernes give hay yields exceeding 100 c. per ha. in the first year and produce a large amount of roots in the soil. The cottons are highly productive of fibre with good technological properties.

3691 Dan, A.
Comisia de stat pentru încercarea soiurilor, rod al colaborării noastre cu U.R.S.S. **(The State Commission for Variety Testing, an outcome of our collaboration with the USSR).**
Probl. Agric., București 1959 : **11** : No. 11 : 64–66.
The working of the above body, constituted along the lines of the corresponding Soviet institution, is outlined.

3692 Oram, P. A.
**Report to the Government of Libya on crop agronomy and improvement in Tripolitania.**
FAO UN, Rome 1959 : FAO/59/9/6931 : Pp. 96. (Mimeographed).
A survey of the improvement so far gained in cereals and other crops as the result of variety introduction and testing is included. It is recommended that these activities should now be reduced in favour of selection and hybridization.

3693 Soghaier, A. A. K.
**Report to the Government of Libya on crop agronomy and improvement in Cyrenaica.**
FAO UN, Rome 1959 : FAO/59/7/5499 : Pp. 81. (Mimeographed).
The results of trials of varieties of cereals and other crops and recommendations as to further means of varietal improvement are included.

3694 Por los centros de investigación. **(At the research centres).**
Agric. téc. Méx. 1959–1960 : No. 9 : 53–57.
Work at Mexican stations includes, in addition to that described below, tests of wheat, maize, barley, rice, sorghum and tomato varieties.
**Rice.** Selection of plants from Bluebonnet 50 x Jojutla, Bluebonnet 50 x Dima, Century Patna 231 x Jojutla and Century Patna x Dima is in progress at Cotaxtla, Veracruz, the aim being the development of varieties with the quality of Jojutla and the earliness and resistance to lodging and diseases of the other varieties.
***Capsicum.*** None of 40 types of chilli proved immune from the 41 strains of *Phytophthora capsici* with which they were tested at El Horno, Chapingo, but plants of *C. pendulum* showed the greatest resistance. Two lines showing a high degree of male sterility have been isolated.
**Pumpkin.** At El Horno, Chapingo, seven uniform lines of good quality and appearance have been selected as a basis for further breeding. A form with seeds lacking a testa has been isolated, which is expected to be of use for oil extraction.
***Phaseolus.*** Uniform lines resistant to *Apion godmani* are undergoing trial at El Horno, Chapingo. A natural hybrid between *Ph. coccineus* and *Ph. vulgaris* has been discovered and various centres of introgression have been located; the hybrid is being artificially crossed with *Ph. vulgaris*. The new varieties Jamapa, Actopan and Antigua [Ancient], which resist rust and mosaic and yield 10–20% more than local varieties, have been released from Cotaxtla, Veracruz.

**Proceedings, abstracts of papers and addresses of the 56th Annual Convention of the Association of Southern Agricultural Workers held in Memphis, Tennessee, February 2-4, 1959** : Pp. 256.

3695 *Stroube, W. H., Fergus, E. N. & Buckner, R. C. Clair, a new variety of timothy.* (*p. 62*).
[Cf. XXIX, 1615].

3696 *Coleman, O. H. & Dean, J. L. The inheritance of resistance to zonate leaf spot in* Sorghum. (*pp. 63–64*).
Study of the cross between Planter and MN960, respectively susceptible and resistant to zonate leaf spot (*Gloeocercospora sorghi*), showed resistance to be dominant and monogenic (*Gl*). *Glgl* was independent of *Pp* for plant colour, *Ss* for glossy *v.* chalky testa, *Bb* for "sub-coat" colour and *Pupu* for reaction to *Puccinia purpurea*.

3697 *Finkner, V. C. An evaluation of the USDA elite winter hardy oat nursery as a source of germplasm for winter-hardiness.* (*p. 64*).
An attempt is being made at the Kentucky Agricultural Experiment Station to isolate the most winter-hardy types among and within entries by natural selection. The average gain

in hardiness from one year of such selection was 9·73 ± 3·68%.

3698 *Harvey, P. H., Thompson, D. L. & Moll, R. H. Three cycles of reciprocal recurrent selection in corn.* (*p. 64*).

Reciprocal recurrent selection for grain yield was initiated in 1948, using two North Carolina synthetics, A and G. Two single and two double hybrids were used as controls in each cycle. The over-all mean of the test-cross progenies has shown a 14% increase from the first to the third cycle. The selfed parents of 8–12% of the best test-cross progenies were chosen for the advancement of the programme. In test-cross performance the selected progenies on the average equalled the mean of the controls. Estimates of genotypic variance and mean progress achieved in these cycles indicate that further improvement in test-cross means should be possible through selection. The estimated amount of inbreeding which has occurred in the recombination of the selected progenies has been calculated for each synthetic. In A the amount of inbreeding ranged from 5·6 to 11·2% and in G from 1·9 to 3·7%. This amount of inbreeding is of minor importance since the "usual plan is to use the selected progenies in cross combination with the opposite population". If, however the selected selfed progenies were used as a synthetic *per se*, this amount of inbreeding would be serious. The interaction of control entries with locality and year was also analysed. The advantages of including more than one control were considered.

3699 *Hebert, L. P. Method of determining Brix with the hand refractometer in selecting sugarcane seedlings.* (*pp. 76–77*).

From analyses at Houma, La., it is concluded that, using the hand refractometer and five stalk samples, the average Brix based upon (1) the middle internode of each stalk, (2) the top mature internode plus the third one from the bottom or (3) all internodes was satisfactory as a Brix determination for any variety at any date during the harvest season, method (1) being the simplest and most rapid. Individual stalks of a clone were highly variable with respect to Brix, with a coefficient of variability of 14·02 as against 4·99 for the whole stool of the same clone. The progenies of crosses were more variable than individual stalks of a variety.

3700 *Campbell, W. V. Resistance of bush beans to the Mexican bean beetle,* Epilachna varivestis *Muls.* (*p. 134*).

Sixty varieties were classified for field reaction to *E. varivestis* at Raleigh, NC. Varieties with a low degree of injury were graded as resistant. Beetles reared on resistant varieties laid only half as many eggs as those reared on susceptible varieties. The size and weight of beetles reared on resistant varieties were also reduced. Resistance was associated with the following characters of the leaves: thickness, number of veins, thickness of vein ribs, length of hairs and ratio of cells to air space in the spongy mesophyll.

3701 *Hernandez, T. P. & Miller, J. C. Self and cross incompatibilities in some sweet potato varieties and seedlings.* (*pp. 156–57*).

Data are given on the self and cross compatibilities of Unit I Porto Rico, Heartogold and six seedlings. Seedling 3–80 was the only highly self-fertile parent. Compatibility apparently depends upon a multiple-allelic *S* system. Preliminary studies also indicate that 3–80 may carry a fertility factor $S^f$ belonging to this series.

3702 *Newsom, D. W. Comparative fiber content of roots of some sweet potato varieties and seedlings.* (*p. 157*).

The percentage fibre content of three varieties and ten seedlings was determined by boiling 200 g. root samples for 10 min. in a 50% NaOH solution and washing through a 200-mesh sieve. The fibre collected in this way was dried for 24 hr. at 100° C. and weighed. The method should prove valuable in breeding.

3703 *Hernandez, T. P., Hernandez, T. & Miller, J. C. Effects of different rates of irradiation on sweet potato roots and tomato seeds.* (*pp. 157–58*).

Unit Porto Rico had a higher frequency of mutations affecting skin and flesh colour than Goldrush and Heartogold with all treatments with $\gamma$ rays (10–50 Kr.). All the mutant changes were from copper skin colour to white or from orange flesh colour to white. In the $R_2$ derived from tomato seeds of the pure line Louisiana 3 exposed to 20 Kr., a new plant type with profuse dichotomous branching appeared. It flowered very late and no mature fruits were obtained.

3704 *Isbell, C. L. & Jones, S. T. Progress, possibilities, and problems with improvement and introduction of new varieties of southern peas.* (*p. 158*).

Cowpea breeding at the Alabama Polytechnic Institute, Auburn, is outlined. Six white and two brown-seeded varieties have been developed

and introduced. Breeding for improved coloured-eye and cream types has resulted in various promising lines. Combinations of different types which have yielded progenies with undesirable features are indicated.

3705 *Miller, J. C. What the breeding program in the south has meant to the industry.* (*p. 164*).
The part played by the release of improved varieties in the potato industry in the southern USA is outlined.

3706 *King, J. R. A new viability test for Irish potato pollen.* (*p. 164*).
The test described is based on the peroxidase reaction on an agar medium. Viable grains may be recognized by their nearly colourless, swollen appearance. Nonfunctional grains become blue and do not swell.

3707 *Oberle, G. D. Some difficulties in approaching the problem of breeding apricots for the eastern United States.* (*p. 176*).
Several problems, such as too early a time of flowering, winter injury to the trunks and crotches and susceptibility to *Monolinia* (*Sclerotinia*) *laxa* and other diseases, confront apricot breeders in Virginia.

3708 *Popenoe, J. Relation of heredity to incidence of bacterial spot on plum varieties in Alabama.* (*pp. 176–77*).
Observations in Alabama during 1958 showed native species and hybrids of these species to be most resistant to bacterial spot. Bruce, Compass, Munson and Opata had the highest degree of resistance to leaf and fruit infection as well as to stem canker. Most European varieties were fairly susceptible to leaf and fruit infection but remained free from stem canker. Japanese varieties displayed a wide range of susceptibility. Eldorado and Wicson, considered to be *Prunus salicina* x *P. simonii* hybrids, were badly damaged by stem canker, as were also the Japanese varieties Abundance Burmosa, Laroda, Nubiana and Sierra. No stem cankers were however found on Burbank, Elephant Heart, Kelsey and Satsuma. Resistant Japanese varieties had a somewhat spreading growth habit, whereas susceptible ones were very erect. It is suggested that erect growth and susceptibility to stem cankers are derived from *P. simonii* and that all susceptible varieties have *P. simonii* in their ancestry. No consistent relationship was found between stem-canker susceptibility and degree of leaf and fruit infection.

3709 *Hare, W. W. Resistance of root-knot nematodes in cowpea.* (*p. 205*).
[Cf. XXIX, 4634],

3710 *Nelson, R. R. The genetics of sexual reproduction in* Cochliobolus heterostrophus. (*p. 210*).
[Cf. XXIX, 3835].

3711 *Moore, E. L. & Powell, N. T. Dominant and modifying genes for resistance to black shank of tobacco.* (*p. 211*).
[Cf. XXIX, 4238].

3712 *Greenleaf, W. H. Breeding tobacco-etch virus resistant Tabasco type peppers.* (*p. 217*).
[Cf. XXIX, 4271].

3713 *Teas, H. J., Winters, H. F. & Almeyda, N. Identification of mango varieties by paper chromatography.* (*p. 223*).
Chromatographic analysis of mature leaf samples showed promise as an aid in varietal identification.

3714 *Bird, L. S. & Joham, H. E. The influence of nitrogen source and carbohydrate change by debudding and girdling on bacterial blight resistance caused by the $B_7$ gene in cotton.* (*pp. 223–24*).
[Cf. XXIX, 4139].

3715 *Bird, L. S. & Ergle, D. R. Seedling vigor characteristics of twelve cotton varieties and how they are influenced by potassium gibberellate.* (*p. 227*).
Varietal disparities were observed in seedling emergence and height without application of potassium gibberellate and in response to treatments with this substance.

IV Reunión latinoamericana de Fitotecnia, Santiago de Chile (24 noviembre al 6 diciembre de 1958). [**Fourth Latin-American Conference on Plant Breeding, Santiago de Chile (24 November to 6 December, 1958)**].
Idia 1960 : No. 145 : 1–78.
After the opening talk the conference took the form of round-table lectures and discussions on various topics. In the present report, general accounts of the papers and discussions under their respective headings are followed by detailed reports of the papers contributed by the members of the Argentine National Institute of Agricultural Technology.

3716 *Kugler, W. F. Proyección de la labor fitotécnica en Latinoamérica.* (*Programme of plant breeding work in Latin America*). (*pp. 4–47*).

In this opening lecture, the importance of plant breeding in Latin America is discussed in general terms.

3717 *Genética* (*Genetics*). (*pp. 25–29*).

In his introductory talk, G. W. Burton gave a list of what a panel of ten breeders regarded as the most important advances in plant breeding made during the past decade; the three most frequently mentioned were: the development of commercial methods of producing $F_1$ hybrids; biometrical genetics; and substitution of chromosomes and genomes.

**Maize.** E. Paterniani reported that in Brazil, varieties from Argentina or Uruguay are early and low in yield, while the Mexican ones are more productive and later. Among flint varieties, Brazilian Catete types are lower in yield than Colombian types, but the hybrids between them yield more than either parent. Other speakers noted that varieties from altitudes below 1500 m., e.g. the coastal region of the Gulf of Mexico, are well adapted in the tropics, possibly as a result of their resistance to the many diseases occurring in this region, and that the nearer the place of origin is to the equator, the greater the adaptability.

The cytology of maize was the subject of an address by A. J. Gurgel. B chromosomes occur in a small number of varieties, are about half the size of the X chromosome, and up to five may be present without phenotypic effect. The presence of 10 or 15 lowers fertility and of 25 causes complete sterility; the highest number observed was 34. The X chromosome was mentioned as having a large block of heterochromatin, which does not pair readily, and as showing preferential segregation, the basal megaspore cell receiving 70% of the chromatin instead of the usual 50%. The frequency of spontaneous haploidy is 1/1000 and may be increased through the use of old or X-irradiated pollen. Other speakers referred to a method of using genetic markers to distinguish haploids so that these may be selected easily, and subjected to chromosome doubling for use in the production of commercial material.

P. C. Mangelsdorf described work on teosinte introgression in maize. The introduction of chromosome I into line A158 has given unstable lines showing a large number of mutations similar to those occurring spontaneously, mostly endosperm, chlorophyll and dwarf mutations; some gametic lethal mutations also occurred. Similar results were obtained with the maize varieties Mexican 1077, Amargo de Argentina [Argentina Bitter], Chocoseño de México and Coroico de Bolivia, suggesting that these similar forms derive perhaps from types, such as *Tripsacum australe*, which later underwent hybridization with maize. A. J. Gurgel mentioned the gene "elongated", which results in absence of reduction in the second meiotic division and which may therefore be useful in breeding tetraploids. Andrés presented data which showed that maize tetraploids were not very promising. Further data provided by A. J. Gurgel showed the frequencies of various mutants appearing in the first generation after pollination in 80 Brazilian maizes. The gene $Ga_1$ lies on chromosome IV, near *SuSu*, and results in very slow growth of the pollen tubes; an allele with an even stronger effect, $Ga_1^s$, is frequent in popcorn.

**Barley.** Phenotypic effects of translocation were mentioned by E. A. Favret. Some, involving a break in chromosome B, alter the susceptibility to *Erysiphe graminis*; others delay maturity.

**Coffee.** A. Carvalho reported that, in *Coffea arabica* ($2n = 44$), the variety Bourbon produces the highest number of haploids. Fertile diploids were developed from these by colchicine treatment and have been X irradiated. A greater frequency of haploids occurs in *C. bullata* ($2n = 66$ or 88).

**Guava.** In pollination studies, five recessive, white-flowered forms in a plantation of some 25,000 pink-flowered plants, gave offspring with pink and white flowers in varying proportions, with a mean of 50%, indicating the rate of natural crossing.

**Solanaceae.** In *Capsicum* and tomato, a high correlation between fruit size and leaf size allows selection to be carried out in the seedling stage.

**Cauliflower.** In Brazil, local forms of the type Bola de Nieve [Snowball] have been crossed with the Indian varieties Early Patria, Early Bernais and Early Market, with the aim of developing early forms. The selections obtained from the crosses are adapted to high temperatures, and if sown in January may be harvested in April.

3718 *Forrajeras* (*Forage crops*). (*pp. 30–33*).

In the sections on breeding and germ plasm, breeding objectives and methods were discussed and recent varieties of grasses and legumes mentioned.

3719 *Maíz* (*Maize*). (*pp. 33–34*).
P. C. Mangelsdorf gave a general lecture on maize breeding, touching on various methods of developing hybrids, on the use of synthetics, on evolution in maize and the maintenance of a gene reservoir.

3720 *Trigo* (*Wheat*). (*pp. 34–38*).
In the section on breeding methods, A. Avila described a microtechnique for quality evaluation [cf. XXIX, 290] and together with other speakers discussed the differences in quality requirements of different countries. It was noted that quality and the content of nitrogen in the gluten are generally independent characters. Outlining the history of wheat breeding in Brazil, J. Beckman mentioned the use of Polyssu as a source of drought resistance. I. Narváez described the Mexican method of breeding composite varieties. In Colombia, breeding for resistance to *Puccinia glumarum* is in progress and a beginning has been made in developing composite varieties. R. Villanueva Novoa reported that, in Peru, the prevalent rust species varies according to altitude; he also listed some of the best varieties bred at La Molina. A similar report on regional differences in rust prevalence and on resistant varieties was given for Chile. Varieties which have yielded well in Ecuador and Monterrey were mentioned by other speakers.
In the section on germ plasm, sources of resistance and agronomic characters, I. Narváez referred to the occurrence of two dominant factors for resistance to *Septoria tritici* in Yactana and Yaqui 48, and E. Godoy and J. Tessi mentioned work on the identification of factors for resistance to *Tilletia*. Plans for international trials for resistance to *Puccinia glumarum* were made.

3721 *Oleaginosas* (*Oil crops*). (*pp. 38–40*).
**Linseed.** Breeding at Pergamino, Argentina, was described [cf. 3725].
**Sunflower.** All Argentine varieties and all introduced material tested is susceptible to a root rot caused by *Sclerotium bataticola* (*Macrophomina phaseoli*). A new race of *Puccinia helianthi* able to attack Canadian material hitherto found resistant has appeared on a species of *Wedelia*. Interspecific crossing was referred to [cf. 3727].
**Groundnut.** [Cf. XXVIII, 4671].

3722 *Papas* (*Potatoes*). (*pp. 40–47*).
The chief breeding objectives in Peru, Mexico, Chile, Brazil and Argentina are resistance to diseases and pests, *Solanum andigenum*, *S. demissum* and *S. stoloniferum* being used as sources of resistance. In a discussion on the effects of inbreeding, progressively greater decreases in vigour from the $F_1$ to the $F_3$ of a cross between the late variety Casablanca and an early variety were reported. In crosses of *S. goniocalyx* clones, differences between the $F_1$ and $F_2$ were slight. Inbred clones of *S. andigenum* gave an $F_1$ containing more genes for blight resistance than either parent. Productive but late-maturing clones have been produced as a result of inbreeding in the variety Paraná Ouro [Paraná Gold].
The report continues with lists of the varieties most commonly cultivated in the various Latin American countries and notes on the most important characteristics of the diploid, triploid, tetraploid and pentaploid cultivated species and the wild species. It is stated that the cross *S. tuberosum* x *S. demissum* has been effected in Brazil with the aid of supplementary fluorescent and incandescent illumination a few minutes before dawn. In Colombia, *S. tuberosum* x *S. andigenum*, which has yielded the variety Monserrate [cf. XXIX, 2713], has given better results than *S. andigenum* x *S. andigenum*, and the latter cross was better than *S. tuberosum* x *S. tuberosum*. The $F_1$ of *S. demissum* x *S. tuberosum* can be crossed with *S. tuberosum*. Heterosis has been observed in crosses between Peruvian and Ecuadorian varieties of *S. andigenum*. In Mexico, use is being made of *S. andigenum* (4*n*), *S. tuberosum* (4*n*), *S. demissum* (6*n*), *S. stoloniferum* (4*n*), *S. bulbocastanum* (2*n*–3*n*), *S. pinnatisectum* (2*n*) and *S. cardiophyllum* (2*n*–3*n*), the last three of which carry resistance to blight. Bolivian work is concerned with (*S. tuberosum* x *S. stoloniferum*) x *S. tuberosum*, *S. tuberosum* x *S. sucrense*, *S. simplicifolium* x clone 52 and *S. vernii* x *S. cardenasii*. After chromosome doubling in *S. rybinii* and *S. stoloniferum*, these species have been crossed with *S. tuberosum*. Forms with 24 chromosomes have been obtained on crossing *S. tuberosum* with *S. rybinii*; these forms are small and low in yield, but both size and productivity may be increased by crossing.
The section on potato breeding and genetics concludes with some remarks on potato collections in various countries and a list of species used in breeding arranged according to their resistance to diseases, nematodes, frost and drought.

3723 *Rossi, J. C. & Petri, F. Programa de mejoramiento de maíz en Pergamino.* (*Maize breeding programme in Pergamino*). (*pp. 52–54*).
Current work includes: the collection of samples

of local populations, including some which have been under cultivation for more than 40 years; the selection and inbreeding of clones from the collected populations; the development of hybrids from such lines as J2, ZQ2, ZN6, ON, YK6, F11 and YW11, which have good combining ability and are resistant to foot rot; the use of male sterility in developing hybrid lines; and the introduction of material from other South and Central American countries into the breeding programme.

3724 *Kugler, W. F. Origen de los linos cultivados en los países rioplatenses.* (*Origin of the linseeds cultivated in the River Plate countries*). (*pp. 54–55*).

A taxonomic study of populations cultivated in Argentina, based on the classification of Wulff and Elladi, showed that the great majority of forms pertained to the botanical varieties *mauritanicum, argentinum, medium, australe, romanum* and *hybridum* of ssp. *transitorium*; one sample corresponded to var. *tauricum*; and 43 unidentified varieties of the group were also found. In addition, two samples of ssp. *mediterraneum* var. *macrophyllum*, three of ssp. *eurasiaticum* and four of ssp. *indoabyssinicum* were recognized. Among important selections from local populations are: P7223, P6808, P6962 and P6899, which are among the progenitors of Puelche, Toba and Timbú; selection 6879, which is immune from all the prevalent rust races in Argentina, the determining factor being distinct from that in Bombay CI42; P7568, with its high oil content (45%) and iodine value (191); and selection 1772, which is highly resistant to lodging and is to be released under the name Tezanos Pinto Taragui.

3725 *Marciotte, C. V. Mejoramiento del lino oleaginoso en Pergamino.* (*Linseed breeding at Pergamino*). (*pp. 56–57*).

The history of linseed breeding in Argentina is outlined. Since 1938, breeding for wilt resistance and immunity from rust has yielded the variety Pergamino Charrúa; and for resistance to *Mycosphaerella linorum*, Puelche [XXVIII, 182], Toba [XXVIII, 182] and Timbú. Since 1951 attempts to develop better varieties than the last three have involved crosses of H8, Klein 11 and CI975 x Crystal. Line 16H785–1270 combines high productivity with the uniform maturity of Klein 11. An endeavour to increase yield by increasing seed size, using the large-seeded variety Indian 1206 as parent, was successful, but the character was accompanied by hard capsules difficult to thresh. The selection 1772–1–2–1–1 is being used as a source of lodging resistance in crosses with Pergamino Puelche, 16H785–1–2–7–0–44 and others.

3726 *Marciotte, C. V. Clave para identificar variedades comerciales argentinas de lino oleaginoso.* (*Key for the identification of Argentine commercial varieties of linseed*). (*p. 58*).

A key based on the presence of white spots on the sepals, colours of the petals, filaments, anthers, style and stigma, form and size of the flower, hairiness of the capsule septa and degree of branching is presented for 12 varieties.

3727 *Godoy, E. F.* et al. *La roya del girasol en la Argentina y el mejoramiento de la resistencia.* (*Sunflower rust in Argentina and breeding for resistance*). (*pp. 60–61*).

At Pergamino, the rust resistance of the Canadian line 953–102–1–1 from Texas Wild Annual x California Oil Seed has been incorporated into the variety Klein, into inbred lines used in hybrid production and into the early Russian variety VNIIMK6540. Two or three back crosses followed by two selfings are generally sufficient to fix the resistance in the lines and varieties. At Manfredi inbreeding of resistant selections from *Helianthus annuus* x *H. argophyllos* and *H. annuus* x *H. cucumerifolius* is in progress.

3728 *Kugler, W. F., Luciano, A. & Davreaux, M. Mejoramiento del girasol en Pergamino.* (*Sunflower breeding in Pergamino*). (*pp. 61–69*).

Breeding at Pergamino, Argentina, has been concerned since 1950 with the development of hybrid varieties. Ten inbred lines giving good yields in certain combinations have been produced and satisfactory quantities of hybrid seed obtained by sowing the parental lines in alternate rows or by sowing mixed parental seed in plots. In some cases only one parent bore hybrid seed, in others both. An association between earliness and susceptibility to a disorder probably caused by *Sclerotium batatícola* was observed in early stages of breeding. In the later stages, rust was found to reduce the high yields of the hybrids and attempts to introduce rust resistance by back crossing are under way. It is believed that a programme of recurrent selection may have been more satisfactory in the long run. *Helianthus cucumerifolius* and *H. argophyllos* have been used as sources of rust resistance at Manfredi and the

further use of wild species in breeding is regarded as important.

3729 *Krapovickas, A. Consideraciones sobre el origen del maní cultivado.* (*Considerations on the origin of the cultivated groundnut*). (*pp. 69–71*).
[Cf. XXVIII, 4671].

3730 *Krapovickas, A. & Rigoni, V. A. "Arachis hypogaea" L., su clasificación botánica.* (A. hypogaea *L., its botanical classification*). (*p.* 71).
From a study of work already published and of the collection maintained at the Manfredi Experimental Station, Córdoba, Argentina, *A. hypogaea* is divided into the following subspecies and varieties: ssp. *hypogaea*, ssp. *fastigiata* var. *fastigiata* and ssp. *fastigiata* var. *vulgaris*. The classification is based on habit and flower and fruit characters and the three taxa correspond to the forms commonly known as Virginia, Valencia and Spanish, respectively.

3731 *Krapovickas, A. "Hibridación introgresiva" en maní.* (*Introgressive hybridization in groundnut*). (*pp. 71–72*).
In the province of Corrientes, Argentina, where agriculture is still practised largely along pre-Columbian lines, a wide variety of morphologically overlapping local types of *Arachis hypogaea* ssp. *fastigiata* is cultivated, together with the form Guaycurú of ssp. *hypogaea*, which is probably introduced and does not appear to have hybridized with other Correntine groundnuts. Analysis of the local populations indicates that they result from natural crossing between three basic types, although the species is generally regarded as autogamous. The three types are the Spanish (ssp. *fastigiata* var. *vulgaris*), the Valencia (ssp. *fastigiata* var. *fastigiata*), and the Porto Alegre (also ssp. *fastigiata* var. *fastigiata*), the last being somewhat branched and having simple spikes and fruits containing four seeds with blackish-violet testa. The first two are well known; the last is less so, but may be involved in the parentage of the recent variety Champagní, which is productive, has a long harvesting period and is resistant to diseases.

3732 *Prácticas culturales en el cultivo de la papa en la República Argentina.* (*Cultural practices in potato cultivation in the Argentine Republic*). (*pp. 74–77*).
The release of Buena Vista and Santa Rafaela [cf. XXIX, 2792] from the Balcarce Experimental Station, Buenos Aires is noted.

3733 Scholz, F.
Strahleninduzierte Mutationen und Pflanzenzüchtung. (**Radiation induced mutations and plant breeding**).
Atompraxis 1959 : **5** : 475–81.
In this general review, mention is made of useful mutants obtained in various countries by the irradiation of crop plants and micro-organisms producing antibiotics. Problems and future prospects of mutation breeding are discussed.

3734 Novikov, V. A.
(**Inducing new characters in plants by changing photoperiodic conditions in the third developmental stage**).
Chi-wu-hsueh Pao (J. Bot.)/Acta bot. sin. 1959 : **8** : 118–27 [Chinese]; also 128–43 [Russian].
[Cf. XXIX, 3574].

3735 Trentin, A.
L'attività dell'Istituto di Genetica di Lonigo nel quadro dell'Annata Mondiale delle Sementi. (**The activity of the Genetics Institute at Lonigo in connexion with the World Seed Year**).
Agricoltura d. Venezie 1960 : **14** : 203–09.
Some of the new varieties produced by the institute are mentioned. They include the wheats G. Giuliari, Lonigo 1, Leonardo [XXVI, 2162] and Leone [XXVI, 2162], the early maize Italo 225 [XXIX, 2591], the lucerne Leonicena [XXX, 2765], the peas Palladio, Lepre [Hare], Lontia and Lupo [Wolf], the rape Olimpiade, characterized by earliness and frost resistance, the soya bean Pantera, possessed of earliness, high yield and yellow beans, and the sunflower Disco volante [Flying Saucer], with large heads, low stem and high yield. Other activities of the institute include seed production and certification and the testing and demonstration of new varieties.

3736 Sokolovskaja, A. P. & Strelkova, O. S.
(**Geographical distribution of the polyploid species of plants in the Eurasiatic arctic**).
Bot. Ž. (Bot. J.), Moskva 1960 : **45** : 369–81. [Russian].
In continuation of previous work [cf. XIII, 110] a report is given of the results of investigations of 168 species from 126 genera belonging to 33 different families. Several members of the boreal and subarctic groups had higher chromosome numbers than the corresponding species growing in the vicinity of Leningrad;

species belonging to the arctoalpine group were mostly diploid whereas those of the arctic group had a large proportion of high polyploids, though there were a number of diploid species too. Thus *Agrostis borealis* has $2n = 56$, whereas *A. trinii* in the eastern area of distribution of the genus has $2n = 28$ and *A. canina* from the Mediterranean $2n = 14$; similar relationships have been found in *Alopecurus*, series *Annuae* from woodlands having $2n = 14$, series *Pratense* from the boreal area $2n = 28$, series *Vaginatae* from the mountains of southern Russia $2n = 56$ and the polar series *Alpinae* higher numbers still, *A. borealis* and *A. alpinus* both having $2n = 100$. The highest numbers for the genus *Primula* are found in *P. stricta* from the island of Kolguev, the number found being $2n = 126–130$. For the Gramineae as a whole the proportion of polyploid species was 54·8% in the Caucasus, 78·9% in the Altaj, 86·1% in the Pamir and 86·3% in the arctic; of these none were octoploid or decaploid in the Caucasus, 7·9% came into these groups in the Altaj, 5·6% in the Pamir and 24·3% in the arctic. The polyploid species are considered to be relatively young species having evolved in the postglacial period.

3737 Brauer H., O.
Androesterilidad provocada con Dalapon. (**Male sterility induced by Dalapon**).
Agric. téc. Méx. 1959–1960 : No. 9 : 6–8.

In experiments with tomato, cotton, pea and maize, doses of Dalapon (sodium 2,2-dichloropropionate) high enough to cause male sterility also damaged the female reproductive organs, while lower doses resulted in only partial or temporary male sterility.

3. Internationale Tagung der CIQ "Pflanzeneiweiss-Nahrungsqualität" am 20. Mai 1959 in Wien. (**3rd International Meeting of the International Confederation for Studying the Qualities of Edible Plants devoted to "plant protein—nutritive quality" on 20 May 1959 in Vienna**).
Qual. Plant. Mater. veg. 1960 : **6** : Pp. 384.

3738 *Scholz, F. Versuche zur züchterischen Steigerung des Eiweissgehalts der Gerste mit Hilfe der experimentellen Mutationsauslösung.* (*Experiments on raising the protein content of barley by breeding with the help of experimental induction of mutation*). (*pp. 276–92*).

X-ray induced mutants of spring barley have been produced showing increases in crude protein content of up to 25%; these mutants do not differ morphologically from the original barleys. In yield trials two mutants gave yields of crude protein per unit area varying between 110 and 125% of that of the original variety. The biological value of the protein of the mutants equals that of the original barley and it therefore seems possible to combine high protein content, good protein quality and high yield. No mutants of winter barley with high protein content have so far been produced.

3739 *Schuphan, W. Die biologische Eiweisswertigkeit der Kartoffel als Qualitätsmasstab für Sortenbewertung und optimale Düngung.* (*The biological value of potato protein as a measure of quality for the evaluation of varieties and optimum fertilizing*). (*pp. 293–98*).

The biological value of potato protein as revealed by nutritional experiments with human beings is a varietal character; it shows a range of variation corresponding to that of the essential-aminoacid index. There is a significant positive correlation between the biological value of protein and the percentage of protein nitrogen in the total nitrogen content and there is a negative correlation between the biological value and the crude protein content.

3740 Busson, F., Carbiener, R., Georgin, A., Lanza, J. & Dubois, H.
Contribution à l'étude de l'influence des facteurs variétaux et écologiques sur la composition en aminoacides de végétaux. (**A contribution to the study of the influence of varietal and ecological factors on the aminoacid composition of plants**).
Ann. Nutr., Paris 1960 : **14** : No. 2 171–76.

Tabulated information is given on the amino-acid composition of the seeds of a number of varieties of *Arachis hypogaea, Kerstingiella geocarpa, Glycine max, Phaseolus lunatus, Ph. vulgaris* and *Voandzeia subterranea* from different parts of Africa. Percentages were found to be remarkably constant within the species.

3741 Perrin de Brichambaut, G.
**The introduction and exchange of plant material between countries of the intertropical zone.**
Pl. Introduct. Newslett. FAO 1960 : No. 7 : 4–6; also in French : 1–3. (Mimeographed).

Suggestions are made as to organization of a

programme on the above, as a possible extension of the campaign already initiated by FAO for the introduction and exchange of material in other regions.

3742 MACER, R. C. F.
**Nature and exploitation of crop plant resistance to disease.**
Nature, Lond. 1960 : **186** : 857–59.

An account is given of the symposium held jointly by the Association of Applied Biologists and British Mycological Society in London, 8–9 January 1960. G. D. H. Bell gave a general introduction to the first day's proceedings, which were devoted to studies of hosts. R. C. F. Macer considered developments in breeding disease-resistant cereals in Great Britain. Difficulties in breeding for resistance to diseases in vegetable crops were outlined by J. C. Haigh, with particular reference to lettuce and tomato. R. L. Knight and his colleagues gave an account of the possible control of raspberry viruses by breeding for resistance to the vector, *Amphorophora rubi*. D. S. Kirkham and A. E. Flood examined the biochemical basis of resistance of apple and pear to *Venturia inaequalis* and *V. pirina*. Another type of biochemical resistance, in this case acting outside the host through root exudates, was described by E. W. Buxton, in relation to studies of resistance in the pea to *Fusarium oxysporum* f. *pisi*. In introducing the discussion, S. C. Harland suggested that further consideration should be given to exploiting polygenic field resistance rather than less stable major-gene resistance. Contributions on the second day were introduced by D. Lewis, who summarized ways in which fungal variability may occur. A. C. Hastie then dealt with variation in *Verticillium albo-atrum* isolated from hops. R. D. Tinline reported on pathogenic and cultural variation in *Cochliobolus sativus*. Interaction, or genetic recombination, between potato viruses Y and C was the subject of a contribution by M. Watson. Physiological specialization in *Puccinia glumarum* and *Phytophthora infestans* was discussed by D. A. Doling, with particular reference to race surveys. G. C. V. Batts gave an historical account of the distribution of races of *P. glumarum* in Britain since 1946. The problem of resistance to *Ph. infestans* was considered by W. Black. The final discussion was opened by C. T. Ingold who, after surveying methods used for identifying physiological races, turned to genetical aspects of pathogens. He expressed the view that the significance of the parasexual cycle was not fully appreciated.

3743 ŽUKOVSKIJ, P. M.
**[Mutual relations between the host and the fungous pathogen at their place of origin and outside it. (A study on initial material for breeding)].**
Vestn. sel'skohozjajstv. Nauk (Rep. agric. Sci.) 1959 : No. 6 : 25–34. [Russian].

Resistance breeding of crop plants generally is discussed in relation to the place of origin of the host plant and its pathogen, special mention being made of wheat rusts and potato blight. The main conclusions are as follows. Field resistance of a host to all physiological races of the pathogen in their joint place of origin is the highest form of historically evolved resistance. The plants from such an area are the most valuable genotypes for introduction and breeding, proving highly resistant on transfer to other regions where virulent mutants or local races are absent. The resistant host genotype can however lose its resistance upon transfer to a distant geographical region, which may subsequently become a secondary evolutionary centre of the pathogen and give rise to new endemic virulent races. If the pathogen is introduced from its place of origin to a new geographical region, where a new highly susceptible host is available, a new centre of infection may be formed. Such infection can only be controlled by breeding by means of resistant host plants from the same place of origin as the pathogen. Resistant hybrids bred in one locality may prove highly susceptible in another, especially if this is the place of origin of the pathogen. The transmission of a gene for resistance is not always obtained by crossing two components belonging to different species, step-by-step hybridization being the method required in resistance breeding. A thorough knowledge of the geographical races of a pathogen is also essential for breeding resistant material.

## CEREALS

3744 **The near east wheat and barley improvement and production program of 1960-65.**
FAO UN, Rome, 20 January 1960 : A376 : Pp. 20. (Mimeographed).

A review of the progress made in the above FAO programme during 1952–59 is followed by information on the activities envisaged for 1960–65.

3745 Solotarev, E.
Ergebnisse der Getreideversuche des Jahres 1957/58. (**Results of the cereal trials of the year 1957/58**).
VersErgebn. BundesVerAnst. alpenländ. Landw. Gumpenstein 1959 : No. 49 : Pp. 62. (Mimeographed).
Tabulated data on the results of trials held at various centres in Austria are reported. The cereals tested were wheat, rye, oats and barley.

3746 Favero, A.
Oltre 92 q.li/ha di mais in collina nella decorsa campagna. (**Over 92 quintals per hectare of maize in the high lands last season**).
Sementi elette 1960 : **6** : No. 1 : 33–36.
In the Italian national competition for plant and seed improvement the prize for wheat went to the variety Funone, that for rice to Balilla a grana grossa [Large-grained Balilla] and that for high-land maize to a double-cross hybrid, 412V, from the United Co. of Brescia, which gave 92·3206 c. of grain per ha. at 373 m. altitude.

3747 Kovalev, A. N. & Ivanova, E. I.
(**Fulfilling the seven year plan in five years**).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1959 : No. 3 : 10–12. [Russian].
Seed production of cereals in the Belgorod province is discussed and two new high-yielding varieties are mentioned, the winter wheat Lutescens 266 and the oat L'gov 1026. The new wheat outyields Ferrugineum 1239 by 9·5 c. per ha. and the new oat outyields Pobeda [Victory] by 7 c.

3748 Brun, L. H.
Forsøk med høstrug og høstkveite. (**Trials of winter rye and winter wheat**).
Forskn. Fors. Landbr. 1960 : **11** : 167–86.
Results of Norwegian trials of winter wheat and winter rye held in 1927–47 and of further winter-wheat trials carried out in 1934–40 and 1948–57 are presented. In the earlier experiments the wheats were not sufficiently winter hardy. In the later trials Virtus, Sigyn II and Vakka [Bushel] were among the best wheats.

3749 **Cereal variety trials.**
J. Dep. Agric. S. Aust. 1960 : **63** : 221–27.
An account is given of trials of wheat, oat and barley varieties in progress in South Australia.

3750 Favret, E. A. & Godeck, W.
Indice de mutación espontánea en cebada y otras gramíneas. (**Index of spontaneous mutation in barley and other Gramineae**).
Rev. Invest. agríc., B. Aires 1959 : **13** : 237–42.
Three formulae for calculating the rate of mutation are given, respectively based on (*a*) the number of segregating spike progenies; (*b*) the numbers of double recessives occurring in the progenies of heterozygous plants as compared with homozygous plants; and (*c*) the assumption, in an autogamous population in equilibrium, that the loss of recessive genes by negative selection is balanced by the production of new alleles by mutation. The values obtained for chlorophyll mutations in barley by means of the three formulae were very similar. The third method was also used to estimate mutation rates in populations of rye, barley, *Agropyron pubescens* and *Festuca arundinacea*. Tetraploid barley and rye showed low mutation rates compared with diploids.

3751 Torge, D., Oproiu, E. & Munteanu, O.
Noi soiuri de grîu de toamnă şi orz de toamnă pentru agricultura R.P.R. (**New varieties of winter wheat and winter barley for agriculture in the Rumanian People's Republic**).
Probl. Agric., Bucureşti 1959 : **11** : No. 8 : 31–39.
Three new wheat varieties are recommended: (1) 301 (16 x Noe 2010–A–7–4–1), an introduction from Bulgaria, which greatly outyields Rumanian standard varieties; (2) Odessa 16, introduced from the USSR; and (3) Cluj 650 [(Ridit x Odvoş 241) x Bánkút 1201], which has high quality and is resistant to lodging. One new high-yielding barley is recommended, Cenad 345.

3752 Huttunen, E.
Otra-ohra ja Kyrö-kaura. (**Otra barley and Kyrö oats**).
Koetoiminta ja Käytäntö 1959 : **16** : p. 14.
The two newest varieties from Tammisto are described. Otra (line Ta 8098), which is derived from a cross between Tammi and Edda, has an excellent yield, and is more luxuriant and longer stalked than Tammi. It is not suitable for cultivation on acid soil or under conditions of spring drought.

Kyrö (line Ta 1606) is derived from the cross a3084 x 03370. It is in the same yield class as Tammi oats and has done well in trials on both peat and mineral soils, including those in northerly districts. It is strong strawed and well suited to intensive cultivation and mechanical harvesting. It has not shown particular susceptibility to drought or a marked tendency to shedding.

3753 Tange, M.
**(Studies on the depth of the crown in cereals. II. The effect of temperature on the length of the basal internode and the depth of the crown).**
Hyogo Noka Daigaku Kenkyu Hokoku : Nogaku Hen/Sci. Rep. Hyogo Univ. Agric. : Ser. Agric. 1959 : **4** : 53–56. [Japanese].

At higher temperature, the length of the basal internode is longer and the depth of the crown shallower than at lower temperatures in rice, wheat and naked barley. The degree of response to temperature, however, is a varietal characteristic in all three crops and tables are given of the reaction of a series of varieties of each.

3754 Jurcev, V. N.
**(A reliable method of determining pollen viability of cereal crops).**
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1959 : No. 3 : 73–74. [Russian].

A staining technique for live pollen of such plants as wheat, oats and rye with erythrosin or methylene blue, with Sörensen's solution as a buffer, is described.

3755 Yen, C.
**(Morphological observations on branched ears of wheat and barley).**
Nung-yeh-hsueh Pao (J. Agric.)/Act. agric. sin. 1959 : **10** : 447–59. [Chinese].

A comparative study is reported of branched ears in *Triticum turgidum, T. durum, T. orientale T. aestivum,* various hybrid segregates of interspecific crosses between these species, barley and some other Gramineae. Various types of branched ear can be recognized, depending on the degree of rachilla elongation, position of branching along the spike and size of grain. The value of the various types of branched ear for breeding is discussed, also the extent to which this character is genetically determined.

3756 Sičkar', N. M. & Luk'janova, M. V.
**(Variation in the chemical composition of the green plant in barley and oats as influenced by varietal characteristics and developmental phases).**
Trud. priklad. Bot. Genet. Selekc., Sborn. Puškinskih Lab. (Bull. appl. Bot. Gen. Pl.-Breed. Works of Puškin Lab.) 1958 : No. 1 : 295–302. [Russian].

Analyses of 23 varieties of barley and 17 of oats grown in the vicinity of Leningrad showed that though in general the oat varieties gave higher yields of green fodder than the barleys, some barley varieties were equal to the oats in fodder yield and superior in content of protein, carotene and ash, one of the best being Poljarnyj 14 [Polar 14]. The oats contained greater amounts of ascorbic acid and sugars and the varieties Hibiny II and Skorospelka [Early oat] receive special mention as being earlier than most other varieties and having a 1·5–2·0% higher dry-matter content.

Among the introduced varieties, some of the early-maturing barleys from Canada are mentioned for their high fodder yield and vitamin content. In general, early varieties had higher contents of ascorbic acid, carotene and protein whereas late varieties had higher yields and sugar contents. Figures are given showing how the composition of the plant varies at different phases of growth.

3757 Guitard, A. A., Kaufmann, M. L. & McFadden, A. D.
**A note on the value of the yield : maturity ratio as an index of yield efficiency of cereal varieties.**
Cereal News 1960 : **5** : No. 1 : 3–6.

Yield efficiency of oat and barley varieties was determined on the basis of the average number of pounds of grain produced per acre per day of development from sowing to maturity. In both cereals, large varietal differences in yield efficiency were detected, which were associated with yield components but not with maturity. The pronounced variation in relative efficiency of the varieties according to locality was attributable to differential response to soil and climatic differences. It may be assumed that yield efficiency is heritable and a less complex character than total yield, upon which maturity has a strong influence. The efficiency index should therefore prove valuable in breeding, particularly when maturity is a limiting factor and improved yield depends entirely upon increase in efficiency.

3758 Kobel, F.
Resistenzzüchtung bei Getreide. **(Resistance breeding in cereals).**
Mitt. schweiz. Landw. 1960 : **8** : 3–12.
Methods and problems of breeding for disease resistance are briefly surveyed, mention being made of work carried out at the research institute in Zürich-Oerlikon.

3759 Pančenko, N. P.
**(Frost resistance of plants in the collection of winter wheat and rye).**
Trud. priklad. Bot. Genet. Selekc., Sborn. Puškinskih Lab. (Bull. appl. Bot. Gen. Pl.-Breed. Works of Puškin Lab.) 1958 : No. 1 : 75–89. [Russian].
The plants were tested in cold chambers at temperatures varying from −12° to −21·5° C., no indirect method of estimating cold resistance having been found satisfactory. The results agreed well with those from testing the varieties in the open without a snow covering. The results of tests carried out over a period of 13 years, which are reported, showed a strong correlation between frost resistance and the length of the vernalization phase in the winter wheat varieties. The hardiest varieties were those from central Kazahstan, the central and lower Volga area, the Altaj and the Omsk and Kirov districts, the most outstanding in tests at −23° C. being Lutescens 116, with a survival of 65%, Alabasskaja, Ul'janovka, Ferrugineum 1239, Erythrospermum 529, two land varieties and Kharkof from Canada, the last having a survival of 40%. The varieties that succumbed completely at this temperature included wheat-*Agropyron* hybrids 599, 186 and 1, as well as most varieties from other countries. In certain varieties, such as Lutescens 329 and Erythrospermum 917, grain from Siberia gave much better survival rates than grain from the vicinity of Leningrad.
The rye varieties tested showed an increase in frost resistance in the course of the winter, in contrast to the wheats, where it diminished notably. The hardiest ryes were those from Siberia, Transbajkal, Kazahstan and the Far East and among those of other countries, ryes from Canada, Sweden, Finland and Germany. The three hardiest of all were Avant-garde, Teleginskaja and Benjakonskaja. The varieties with the longest vernalization stage were most tolerant of spring frosts.
Some varieties of winter wheat and rye proved capable of effecting their vernalization stage at temperatures of −4° and −6° C. respectively.

3760 Kisljuk, M. M.
**(Negative temperatures as a factor in the variability of cereals).**
Trud. priklad. Bot. Genet. Selekc., Sborn. Puškinskih Lab. (Bull. appl. Bot. Gen. Pl.-Breed. Works of Puškin Lab.) 1958 : No. 1 : 140–54. [Russian].
Vernalized seed of the wheat Zemka was treated at −6° to −8° C. for 25 days and sown in the spring of 1949; seed of the progeny was treated at −2° C. and sown in spring, after which the next three generations were sown at the normal time in autumn. The crop exceeded the standard by 43% in yield but segregated for morphological features; by further selection some promising lines with large grain, ripening 7–9 days earlier than the standard, have been produced; in winter hardiness they are equal to Borovičskaja, the standard for the Leningrad district. By similar treatment of Kronenweizen [Crown wheat], winter-hardy lines were produced and these also varied in morphological characters; some selections from these have exceeded the standard by 29% in grain yield. Treatment of Wilhelmina wheat at −2° C. gave rise to increased hardiness, earliness and grain quality but also longer straw and laxer ears and other morphological variations. Some useful selections possessing frost resistance combined with good grain quality and strong straw have been made from this material and one of them yielded 24% more than the standard in 1955–56. The treatment with −2° C. was most effective when applied in the early phases of the vernalization process; in the later phases lower temperatures were required. Partial vernalization was less effective in bringing about hereditary changes. Spring wheats treated for 2–3 consecutive generations at −2° or −4° C. also gave rise to hereditary variations, which included winter forms of the variety Diamant unchanged in all morphological features.
Two varieties of spring barley were also subjected to temperatures of −4° and −6° C. and when the progenies were sown in autumn some lines behaved as winter barleys and proved more winter hardy than H–2929, the hardiest variety known; the hardy selections from treating Kolhoznyj 7 [Collective Farm 7] and Golyš, both naked two-rowed barleys, were all six-rowed hulled barleys; the length of the vernalization stage in some of them was over 20 days. All the new lines are however inferior to the parent variety in strength of straw. Increases in winter hardiness were induced in a Swedish winter barley, K–17019, by similar treatments, using temperatures ranging from

−2° to −6° C. One line so produced has been named Puškinskij Ozimyj 1 [Puškin Winter 1] and exceeds H–2929 by 40% in grain yield, having stronger straw and grain of good quality. The oat Orel [Eagle] after being subjected for four generations to low temperatures gave rise to fatuoids, plants with rough awns and various other anomalies; some of the lines obtained exceeded Orel in grain yield by 18–24%. The awned lines mostly produced a number of fatuoids in their progenies and some of them segregated for time of maturity and other characters. A few winter forms arose from similar treatments of the oat Zolotoj Dožd' [Golden Rain].

3761 Aufhammer, G., Fischbeck, G. & Grebner, H.
Versuche zur Prüfung der Dürreresistenz von Sommergetreide. (**Experiments to test the drought resistance of spring cereals**).
Z. Acker- u. PflBau. 1960 : **110** : 117–34.

A collection of 14 spring wheats and 12 spring barleys was investigated under a number of different sets of conditions. The results showed that no reliable comparisons can be made if the soil volume is below a given minimum, 196 cc. being found to be definitely too low, as no grain was produced. Provided some grain was formed, the relative order of the cultivars was however the same in small pots as in large. All cultivars gave less yield when grown under conditions of deficient humidity but *Triticum sphaerococcum* var. *spicatum* 'Cawnpore' from India reduced its yield less than others. Most cultivars that were classed as resistant under constant drought conditions also proved to be more tolerant of brief periods of drought. Some resistant cultivars produced relatively high numbers of inferior grains per ear under drought conditions whereas others, such as Rival, produced well-filled grains with a high 1000-corn weight; this latter type is considered particularly promising for breeding. The resistant barleys were distinguished mainly by good sets of grain per ear.

Testing drought resistance on the basis of the grain yield after the leaves had been removed from the plants gave only partial agreement with the results of actual drought tests, but the good capacity for grain development in Rival was evident also in these experiments.

Marked differences in germination capacity were detected after the grain had been heated for 2 hr. at 100° C., the varieties that tolerated this treatment most successfully being Rival and Tiroler früher Binkel [Tyrolese early club wheat]; other drought-resistant varieties however were damaged more severely than some less resistant ones. Nor did the cultivars with the greatest tolerance of drought or of heat invariably have the highest root weights.

3762 Anpilogov, M. Z.
(**Methods of classifying initial material for resistance to fungous diseases and choice of pairs for crossing**).
Trud. priklad. Bot. Genet. Selekc., Sborn. Puškinskih Lab. (Bull. appl. Bot. Gen. Pl.-Breed. Works of Puškin Lab.) 1958 : No. 1 : 200–30. [Russian].

One of the factors that may affect the results of resistance tests is seed provenance; seed of some varieties of wheat and oats reproduced in the south gave rise to plants that were more susceptible to smut than local material when tested at Puškin near Leningrad; certain varieties on the other hand retained their resistance wherever they were reproduced and these are considered to be the most useful for breeding; one such variety was the oat 157, a hybrid from *Avena byzantina* from Algeria x Zolotoj Dožd' [Golden Rain]. Certain wheat varieties have been found to be rust resistant only under conditions of environment that are relatively unfavourable for the development of the parasite; hence testing should be carried out under a wide range of conditions.

Some varieties of wheat and oats held to be resistant were heavily attacked when infected with smut inoculum from one or two infected plants in the population whereas other varieties were not; such varieties include Markton oats and forms of *A. byzantina* from the USA and Algeria. Infection of 13 spring wheat varieties with local inoculum of bunt at Puškin gave a higher percentage of attack in most cases than infection with mixed inoculum of varied provenance. It is thus considered desirable to test with local inoculum and even, when it is available, with inoculum from the varieties to be tested.

Data are given on the reaction of a number of $F_1$ hybrids from crosses of oats and spring wheat in which the resistant parent in one case possessed mature-plant resistance and in the other resistance during all phases of growth. In most cases mature-plant resistance to crown rust in oats was recessive or partially dominant whereas full resistance was dominant and the same applied to resistance to brown rust in wheat.

A number of varieties of spring wheat have proved to be heterogeneous in regard to brown rust resistance and give $F_1$ generations differing in reaction according to the particular individual used for crossing. Similar heterogeneity has been observed in a number of winter wheats, some of which proved resistant in autumn sowings but susceptible when vernalized and sown in spring; others proved resistant under all circumstances. When wheat and oat varieties were infected with bunt for a number of successive years some became progressively more resistant, showing the presence of genetic heterogeneity, whereas others did not.

Very few wheat varieties proved to be resistant to brown rust in all localities and years; those that were included *Triticum monococcum, T. timopheevi,* a number of spring wheats from Argentina, Rudorf from the USA and three winter wheats bred at the North Osetia breeding station in the USSR from crosses of the Argentine variety Vencedor [Victor] with the American Kawvale: Osetinskaja 3 [Osetian 3], Osetinskaja 4 and Erythrospermum G–720.

3763 Wood, L. S.
**Genetic variation of *Helminthosporium sativum* in relation to seedling blight of small grains.**
Diss. Abstr. 1959 : **20** : LC Card Mic 59–3783 : p. 1136. (Abst.).

Tests on 103 isolates of *H. sativum* (*Cochliobolus sativus*) revealed considerable association between the relative degrees of pathogenicity of a given isolate on barley, wheat and oats. No association was detected between the source of an isolate and its virulence. Genetic changes in pathogenicity were of frequent occurrence in monosporous cultures. Monosporous lines derived from a moderately virulent parent culture and from a highly virulent one were of the same or of greater virulence than the parent, while the progeny derived from a weakly virulent parent culture tended to be of the same or of lesser virulence than the parent.

3764 Tinline, R. D., Stauffer, J. F. & Dickson, J. G.
***Cochliobolus sativus*. III. Effect of ultraviolet radiation.**
Canad. J. Bot. 1960 : **38** : 275–82.

Ultraviolet treatment of the spores induced mutants differing from their parents in degree of sporulation, rate of growth, pigmentation, amount of aerial mycelium, topography and consistency of colony, and pathogenicity to wheat seedlings. Data from tetrads from crosses between weakly and highly pathogenic strains indicated that pathogenicity was not a clearly segregating character.

3765 Nelson, R. R.
**Evolution of sexuality and pathogenicity. 1. Interspecific crosses in the genus *Helminthosporium*.**
Phytopathology 1960 : **50** : 375–77.

Interspecific crosses were attempted using *H. maydis, H. carbonum, H. oryzae, H. sativum, H. setariae, H. victoriae, H. sorghicola* and *H. sacchari*. In addition 5 isolates of *Helminthosporium*, 2 each from rice and oats and 1 from Bermuda grass (*Cynodon dactylon*), were used.

The following crosses were successful: *H. maydis* x *H. oryzae, H. maydis* x *H. sorghicola, H. maydis* x *H. carbonum, H. maydis* x *H. sacchari, H. maydis* x *H.* sp. 1 (rice), *H. maydis* x *H.* sp. 2 (rice), *H. carbonum* x *H. sativum, H. carbonum* x *H. victoriae, H. setariae* x *H. sativum, H. carbonum* x *H.* sp. 5 (Bermuda), *H.* sp. 1 (rice) x *H.* sp. 5 (Bermuda), *H.* sp. 2 (rice) x *H.* sp. 5 (Bermuda) and *H.* sp. 1 (rice) x *H.* sp. 2 (rice).

Viable ascospore progenies have been isolated from nine of these crosses, but development did not continue beyond the production of mature asci in *H. maydis* x *H. sacchari, H. carbonum* x *H. sativum, H. setariae* x *H. sativum* and *H. carbonum* x *H.* sp. 5 (Bermuda). Perithecial production was abundant in *H. carbonum* x *H. victoriae, H. maydis* x *H. oryzae, H. maydis* x *H. sorghicola* and *H. maydis* x *H.* sp. 1 (rice), but scant in the other crosses. All 13 crosses produced perithecia and asci typical of the genus *Cochliobolus*. The perfect stage of *H. victoriae,* a *Cochliobolus* species, has been obtained.

It is not known whether the failure to develop viable ascospores in the four crosses mentioned is due to inadequate techniques or to a genetic block in reproduction. Preliminary studies on the compatibility reaction of ascospore isolates demonstrate that some are cross-fertile with one or other of the parents whereas others do not mate with either parent. The fact that interspecific crosses are possible suggests a similarity in compatibility mechanisms although it is shown that compatibility is probably governed not by a single gene but by either a complex locus or a series of separate loci.

Some information on the evolution of pathogenicity was obtained from studies with the ascospore progeny of *H. maydis* x *H. oryzae*. While some of the progeny were pathogenic on either rice or maize, others produced disease symptoms on both. It is possible that these species, although relatively host-specific, may

have genes in common for pathogenicity, "particularly in view of the fact that pathogenicity in this group appears to be controlled quantitatively".

3766 **Report of cooperative uniform cereal rust observation nurseries for the year 1959.**
US Dep. Agric., Agric. Res. Serv., Crops Res. Div., Pl. Industr. Sta., Beltsville, Md. 1959 : No. 41 : Pp. 38. (Mimeographed).
Tabulated data are given on the reactions of varieties and selections of (1) wheat to *Puccinia graminis* var. *tritici* and *P. recondita* var. *tritici* and (2) barley to *P. graminis* var. *tritici* and *P. hordei* in observation nurseries in the USA. In addition, information is provided on races and subraces of the pathogens. The most interesting features of the observations are discussed.

3767 Hassebrauk, K.
Gedanken zur Züchtung auf Getreiderostresistenz. (**Thoughts on breeding for rust resistance in cereals**).
NachrBl. dtsch. PflSchDienst., Stuttgart 1959 : **11** : 166–69.
Methods of determining rust races and the possibilities of improving resistance by breeding are discussed. The importance of breeding for tolerance as well as resistance is emphasized.

3768 Björkman, I.
**Experiments with cereal rusts on detached leaves in benzimidazole.**
Bot. Notiser 1960 : **113** : 82–86.
The identification of cereal rust races by means of detached leaves either floating on benzimidazole solution in Petri dishes or placed with their lower ends in the solution in tilted dishes is described. One primary leaf from each differential variety is used and its wax coating removed prior to inoculation. In studies of crown rust of oats a concentration of 40 p.p.m. of benzimidazole for the horizontal dishes and of 60 p.p.m. for the tilted dishes was most suitable. The infection types were more easily distinguished in the tilted dishes. The drawback of the method is the slight difference in reaction type of the differential varieties from the reaction seen in the greenhouse. The advantages are the saving in space and in the time needed for the multiplication of the fungus and the possibility of keeping environmental conditions constant.

3769 Leppik, E. E.
**Some viewpoints on the phylogeny of rust fungi. III. Origin of grass rusts.**
Mycologia 1959 : **51** : 512–28.
The author discusses evidence in favour of the hypothesis that the ancestral rusts attacking the early-Mesozoic conifer forests began to spread to new environments during that period, successively giving rise to the Melampsoraceae, Gymnosporangiaceae and Pucciniaceae.

## WHEAT

3770 Ştefan, I. & Mitroiu, V.
Comportarea unor soiuri de grîu de primăvară la Staţiunea experimentală agricolă Suceava. (**Behaviour of some spring-wheat varieties at the Suceava Agricultural Experimental Station**).
Stud. Cercet. şti., Biol. Şti. agric. Iaşi 1959 : **10** : 141–48.
Variety trials of *Triticum aestivum* and *T. durum* during 1955–57 are reported, information being provided on yield and smut resistance.

3771 Giosan, N., Săulescu, N., Şarpe, N. & Coculescu, Gr.
Valoarea noilor soiuri de grîu de toamnă în lumina rezultatelor experimentale din anii 1958–1959. (**The value of new varieties of winter wheat in the light of the results of experiments in the years 1958-59**).
Probl. Agric., Bucureşti 1959 : **11** : No. 10 : 20–38.
As the result of trials of introduced and Rumanian varieties at the Rumanian Maize Institute, a number of foreign varieties, in particular introductions from the USA, were found to be more productive than locally bred wheats.

3772 Walkden Brown, C. & Fitzsimmons, R. W.
**Wheat varieties for 1960.**
Agric. Gaz. NSW 1960 : **71** : 82–96.
Recommended varieties are discussed in relation to current problems of wheat growing in New South Wales. Mention of the following promising lines under test is included: three backcross lines of Gabo into which stem-rust resistance from Kenya 117A or *Triticum timopheevi* has been incorporated, and M972 [(Gular x Dundee) x (Gular x Bencubbin)] which, although susceptible to stem rust, is considered to be of possible value on account of its good grain

quality, high yield, flag-smut resistance and satisfactory strength of straw.

3773 Beni, G.
**Interazione stazione x varietà e prove pluriannuali nella sperimentazione collegiale sul frumento per l'Italia settentrionale. (The interaction station x variety and tests extending over several years in the collective experiments on wheat for northern Italy).**
Genet. agr. 1960 : **11** : 377–93.

The results of trials of 27 varieties carried out at seven different places in the Po valley in 1956–57 in a lattice design with four replications are presented. There were significant differences between the varieties and between stations, some varieties behaving differently at different stations. The results of the trials correspond closely with those of trials of the same varieties over a period of years, the differences being sometimes more significant. This confirms the view of Landi [XXVIII, 7] that tests at a number of stations can be used in place of trials over a number of years. In both sets of trials the cultivar Leone [Lion] exceeded Mara in yield when subjected to low or variable temperatures.
These results were confirmed by those from 1957–58.

3774 Mero, A. & Praksin, S.
**(Wheat in Albania).**
Zemledelie (Agriculture) 1959 : **4** : 89–92. [Russian].

This report on recent Albanian wheat trials mentions T130 which was bred at the Mičurin Institute in Tirana. In 1958, with a yield of 62·6 c. per ha., it outstripped all other varieties including recent introductions from Italy. Fortunato was the next best.

3775 Wagenaar, E. B.
**Note on a case of localized asynapsis in *Triticum*.**
Canad. J. Bot. 1960 : **38** : 265–66.

A case of asynapsis in a single floret on the spike of a plant from a progeny of a *T. timopheevi* x *T. durum* hybrid is reported. An average of 2·5 bivalents and 23·9 univalents was recorded from 35 pollen mother cells. The floret was taken from the upper half of the spike.
In a second floret, taken from the lower half of the spike, an average of 12·8 bivalents and 3·4 univalents was recorded, falling well within the range expected for this progeny. The plant concerned had 28 chromosomes and one fragment, which was included with the univalents.

3776 Bhatnagar, M. P., Bhargava, P. D. & Gandhi, S. M. .
**Progressive lethal necrosis in a varietal hybrid of common wheat.**
Curr. Sci. 1960 : **29** : 68–69.

$F_1$ seedlings from RS31–1, (Jaipur Local x C591) x Gabo, and the reciprocal failed to survive longer than 4–5 weeks because they developed a lethal necrosis. Since Gabo figures as an important stem-rust resistant parent in breeding in India, a genetic explanation of the lethal condition is being sought and an attempt is being made to eliminate the genes responsible.

3777 Krasnjuk, A. A.
**(Forming populations as a method of breeding winter and spring wheats).**
Agrobiologija (Agrobiology) 1959 : No. 3 : 325–34. [Russian].

An account of breeding hybrid populations employing the following techniques at Saratov is given: (1) interspecific hybridization or crossing spring and winter wheats or varieties of different geographical origins, (2) selection of family lines for high yield and other desired characters, and (3) establishing populations from the selected components. Several promising hybrid populations of hard and soft spring and winter wheats have been obtained in this way. Among those which have reached final stages of selection are the hard wheats Jugo-Vostočnaja 144 [South-eastern 144] (Hordeiforme 432 x *Triticum turgidum* var. *salomonis*) and Jugo-Vostočnaja 155 (*T. turgidum* var. *salomonis* x *T. polonicum*). Both these have large grain and are resistant to lodging and highly productive on irrigated soil. Worth mention among the soft spring wheats are Graecum 310 (Hostianum 237 x Albidum 43) and Albidum 218 (Erythrospermum 841 x Lutescens 329), which are strong wheats with technological and biochemical properties superior to the standard Albidum 43; both outyield the standard variety. The most advanced stage in breeding hybrid winter wheats has been reached with three populations selected from the progeny of Ukrainka 246 x Milturum 321. One of these comprises forms belonging to botanical var. *graecum* and the others *erythroleucon* and *alborubrum* respectively. All three populations are referred to as winter hardy, with large grain and good grain set. Work on developing hybrid populations from Sarrubra x

Lutescens 1060/10 and (Lutescens 230 x Kahetian) x Kazahstan is making good progress.

3778 Šejnina, S. L.
**(Hybrids between *Triticum carthlicum* and other wheat species).**
Trud. priklad. Bot. Genet. Selekc., Sborn. Puškinskih Lab. (Bull. appl. Bot. Gen. Pl.-Breed. Works of Puškin Lab.) 1958 : No. 1 : 128–33. [Russian].

In crosses with *T. aestivum* sets of over 65% were obtained when *T. carthlicum* was used as seed parent but less than 3% in the reciprocal; crosses with *T. durum* and *T. timopheevi* were also more successful when *T. carthlicum* was the seed parent. In crosses with *T. sphaerococcum* the set and germinating capacity varied with the variety of *T. carthlicum* used but such differences were not found in the reciprocal cross, in which the grains were all smaller. Hybrids of *T. carthlicum* var. *rubiginosum* x *T. sphaerococcum* were highly fertile and formed good grains, larger than those of the parents; the fertility was retained in the $F_2$ and $F_3$. In the reciprocal cross and in the crosses with *T. carthlicum* var. *fuliginosum* fertility and germinating capacity of the grains were low. The $F_1$ of *T. carthlicum* var. *rubiginosum* x *T. sphaerococcum* eared 5 days and matured 21 days before the earlier parent, *T. carthlicum*; still earlier plants appeared in the $F_2$ and $F_3$, together with some very late and even some winter types. The reciprocal hybrids and those with *T. carthlicum* var. *fuliginosum* were intermediate in time of maturity. Hybrids with *T. durum* and with *T. timopheevi* also gave a certain number of winter plants in the $F_2$ and $F_3$.

Plants resembling Abyssinian *T. durum* segregated in a cross of (*T. carthlicum* var. *rubiginosum* x *T. carthlicum* var. *fuliginosum*) x *T. aestivum*; they were fertile and bore larger grain than either of the parental species.

Hybrids of *T. carthlicum* x *T. timopheevi* showed variations in pubescence in different parts of the plant; in the $F_2$ and $F_3$, plants resembling *T. aestivum* and *T. durum* appeared and in the $F_2$ of *T. carthlicum* var. *rubiginosum* x *T. sphaerococcum* plants resembling *T. aestivum*.

The hybrids with *T. timopheevi* were completely free from disease in the $F_1$ but some plants in the later generations were attacked by mildew, to which both parental species were resistant. An exceptional number of albino seedlings appeared in the crosses of *T. carthlicum* var. *fuliginosum* x *T. timopheevi*.

3779 Skurygina, N. A.
**(Hybridization of soft wheat with *Triticum timopheevi* Zhuk.).**
Trud. priklad. Bot. Genet. Selekc., Sborn. Puškinskih Lab. (Bull. appl. Bot. Gen. Pl.-Breed. Works of Puškin Lab.) 1958 : No. 1 : 134–39. [Russian].

In the cross *T. aestivum* ($2n = 42$) x *T. timopheevi* var. *viticulosum* ($2n = 28$) the set of grain was much lower but the germinating capacity of the grains higher than in the reciprocal cross, where sets of up to 48 and even 90% were obtained but very few grains germinated. The success of the cross varied very much according to the conditions of the environment.

The $F_1$ plants from the reciprocal cross were later in maturity but otherwise no difference was observed between the two $F_1$ generations; both exceeded the parent species in tillering capacity and height, some plants reaching a height of 140 cm., but were otherwise intermediate in characters, having a chromosome number of $2n = 35$. They were self sterile and the anthers contained only 4–12% of fully developed pollen grains. Open pollination and pollination with *T. timopheevi* or *T. durum* produced very few grains but pollination with *T. aestivum* gave a set of about one grain per ear. No increase in set was attained by growing the plants under conditions of high fertility.

3780 Ljaščenko, I. F., Ipekdžian, B. M. & Alekseeva, R. L.
**(Interspecific hybridization of wheats).**
Učen. Zap. rostov. Univ. (Sci. Mem. Rostov. Univ.) 1957 : No. 28 : 73–77 : from Ref. Ž. (Ref. J.) 1958 : No. 20 : Abst. 90424 : p. 36. [Russian].

Short descriptions are given of the following interspecific hybrids obtained by the authors: *Triticum vulgare* x *T. sphaerococcum*; *T. spelta* x *T. compactum*; *T. sphaerococcum* x *T. spelta*; and hybrids of *T. durum* with *T. dicoccum*, *T. polonicum*, *T. persicum* and *T. spelta*.

3781 Riley, R.
**The meiotic behaviour, fertility and stability of wheat-rye chromosome addition lines.**
Heredity 1960 : **14** : 89–100.

Lines of wheat with disomic additions of chromosome I, II, III, IV or V from the rye King II were studied at the Plant Breeding Institute, Cambridge, England, the recipient wheat being Holdfast. The lines were less regular at meiosis than Holdfast, chiefly because

of the failure of the rye chromosomes to pair. In both disomic and monosomic addition lines, I, II, and V caused little disturbance in the conjugation of the wheat chromosomes, but II and IV evidently carried genes interfering with this pairing. The disomic addition lines differed considerably in fertility but none was as fertile as Holdfast. Lines disomic for III and IV had the highest and lowest fertility, respectively, although similar in having the most irregular meiosis. Reduced fertility therefore appeared to have a genetic rather than cytological origin and to be due to deleterious interaction between rye and wheat genes. Failure of the rye chromosomes to pair led to their loss in progenies of the disomic addition lines. This loss and the high competitive ability of euploid pollen over aneuploid addition pollen would cause the rapid return of a population derived from a wheat-rye addition line to the euploid state.

3782 Rommel, M.
**The effect of embryo transplantation on seed set in some wheat-rye crosses.**
Canad. J. Pl. Sci. 1960 : **40** : 388–95.

Embryos of 2*x*, 4*x* and 6*x* wheat species were transplanted to endosperms of 2*x*, 4*x* and 6*x* wheats, rye, barley, amphiploid *T. durum-Agropyron elongatum* and oats. In comparison with the control ♀ parents (plants from 2*x*, 4*x* or 6*x* wheat embryos transferred to their own endosperms), plants from embryos transplanted to alien types of endosperm did not give a better set of fully developed seeds, when used as ♀ parents in wheat-rye crosses. The data on seed set supported the hypothesis of the presence of crossability genes in some wheat parents. When present, these genes appeared to be the same in 4*x* as in 6*x* wheat varieties. The main effect of the crossability genes was not, however, expressed in the endosperm.

3783 Qureshi, S. A.
**A study of natural and radiation-induced recombination in *Triticum-Agropyron* octoploids.**
Diss. Abstr. 1959 : **20** : LC Card Mic 59–3157 : p. 842. (Abst.).

Two *Triticum-Agropyron* octoploids, SH191 and SH198, are cytologically stable and carry the disease resistance of the *Agropyron* parent but lack the seed size and quality of bread wheats. Octoploids of the following combinations have suitable kernel characteristics and were therefore used in crosses with SH191 and SH198; *T. timopheevi* x *T. polonicum*, *T. timopheevi* x *T. orientale* and *T. timopheevi* x *dicoccum*. $F_0$ seeds were treated with X rays and neutrons. Plants from both treated and untreated seed were partially or completely sterile. Compared with the controls, the frequency of multivalents was higher in both the first and second generations after treatment with each type of radiation, and in the second generation more classes of recombinants and a higher frequency of the desired classes of recombinants were obtained. Fifty-six chromosomes were observed only in sporocytes carrying higher numbers of multivalents. The retention of the parental chromosomal material through induced translocations appeared, therefore, to explain the higher frequency of recombinants carrying wheat-*Agropyron* characters and wheat-like kernels. Plants with wheat-like kernels obtained as natural recombinants had lost some chromosomes, 52 being the maximum 2*n* number. Neutrons were more effective than X rays in inducing interchanges, the frequencies of which were respectively 1·00–1·14 and 0·43–1·01.

3784 Smith, E. L., Sebesta, E. E., Schlehuber, A. M. & Young, H. C. (Jun.)
**Association of certain plant characters in a collection of wheat x wheatgrass hybrids.**
Tech. Bull. Okla. agric. Exp. Sta. 1960 : No. T–82 : Pp. 31.

A total of 542 advanced-generation hybrids of wheat-*Agropyron*, all winter annuals, was classified for (1) head type, (2) awn condition, (3) glume pubescence, (4) leaf roughness, (5) leaf-rust reaction and (6) heading date in nursery sowings. Certain hybrids were also tested for leaf-rust reaction in the greenhouse and in special field plantings. Immunity from this disease was found in less than 20% of the hybrids and the incidence of immunity was more frequent in grass-like, rough-leaved or late-maturing plants. Several wheat-like hybrids and single-plant selections were highly resistant to leaf rust as seedlings and highly resistant or immune as mature plants. The potential value of the material for breeding is considered in the light of recent work reported on the cytogenetics of wheat-*Agropyron* hybrids.

3785 Pisarev, V. E.
**(Utilizing polyploidy in wheat breeding, in particular for high protein).**
Trud. nauč.-issled. Inst. Zern. Produkt. Pererabotk. [Proc. sci. res. Inst. Grain Product. Process.] 1957 (1958) : No. 35 : 62–75 : from Ref. Ž. (Ref. J.) : 1958 : No. 22 : Abst. 98957 : p. 34. [Russian].
[Cf. XXVIII, 281].

3786 D'Amato, F. & Moschini, E.
Effetti morfologici e genetici di radiazioni ionizzanti nelle varietà di grano "Cappelli" e "Brescia". (**Morphological and genetical effects of ionizing radiations in the wheat varieties Cappelli and Brescia**).
Caryologia 1959 : **12** : 317–37.

Resting grains of *Triticum durum* 'Cappelli' and *T. aestivum* 'Brescia' were irradiated with X rays and thermal neutrons. The progeny of Cappelli showed a greater effect than that of Brescia subjected to the same irradiation dose, the effect being expressed in reduced survival, increased sterility, reduction in height of plant and the appearance of morphological aberrations, several of which were conditioned by dominant genes. In the $R_2$ generation, 7·55% of chlorophyll mutations were obtained in the progeny from treatments with 15,000 r. in Cappelli; this is higher than the proportion reported in *T. durum* by other workers, though the types of mutants were the same. The corresponding $R_2$ progenies of Brescia contained less than 1% of chlorophyll mutants, the *tigrina* mutants being unusually frequent.
Treatment with neutrons gave a higher proportion of mutants than treatment with X rays, the superiority being sometimes as much as 5 times; the survival was also greater in the treatments with neutrons. The morphological mutants were of a similar type to those reported by other authors.

3787 Montevecchi, P.
Mutazioni insorte nel frumento in seguito a trattamenti poliploidizzanti. (**Mutations arising in wheat as a result of treatments with agents inducing polyploidy**).
Genet. agr. 1960 : **11** : 277–87.

The effects of treating grains of Mentana wheat with colchicine are described; swelling was observed in most of the organs of the plant and some plants showed growth anomalies of various kinds; many were late in development and some were sterile. A number of plants had sectors with different chromosome numbers, variants with both increases and decreases from the original hexaploid number being observed; in succeeding generations adjustments to the normal number usually took place, the lines ending up with $2n = 42$ and in one case $2n = 28$; this last plant resembled *Triticum durum* in most features. Segregation of morphological characters sometimes occurred in the later generations, in which speltoids, compactoids, hooded forms and plants with branched ears appeared.

3788 Enčev, Ja., Moskov, I. & Bozova, L.
(**The change of the spring wheat Erythrospermum 341 into a winter-hardy winter form**).
Dokl. Vsesojuzn. Akad. sel'skohozjajstv. Nauk Lenin (Proc. All-Un. Lenin Acad. agric. Sci.) 1959 : No. 6 : 10–14. [Russian].

Changes in the anatomical, morphological, physiological and biochemical properties of the above spring variety after it had been transformed into a winter wheat at the Dimitrov Agricultural Institute in Bulgaria are described. It was found that the derived winter form developed more slowly than the initial variety when sown in the autumn. The leaves of the new winter wheat had wider and shorter stomata and there were more stomata per unit of leaf surface. The epidermal cells of the winter form were smaller and the respiration rate and peroxidase activity in the autumn were higher. The winter form assimilated more sugar and had a higher invertase activity. The new winter wheat outyielded the Bulgarian winter standard 301 by 6·01 c. per ha.

3789 Ciferri, R. & Bonvicini, M.
Revisione delle vecchie razze italiane in rapporto ai frumenti mediterranei. III. *Triticum durum* L. (**A survey of the old Italian varieties in relation to Mediterranean wheats. III. *T. durum* L.**).
Ann. Sper. agr. 1960 : **14** : No. 3 : Suppl. : xxxv–xcvi.

The descriptions are continued [cf. 2501].

3790 Marjanen, H.
Norröna-kevätvehnän satoisuus paikalliskokeissa. (**The productivity of Norröna spring wheat in local trials**).
Koetoiminta ja Käytäntö 1959 : **16** : p. 38.

This Norwegian variety has surpassed all others tested in Finland in yield, giving nearly four times that yielded by Timantti [Diamond] and twice that of Apu [Aid], the next highest yielding. It has satisfactory baking quality and is comparatively resistant to loose smut. Its strength of straw is comparable to that of Timantti and Apu.

3791 Harris, R. H. & Sibbitt, L. D.
**The quality of two new durum varieties.**
N. Dak. Fm. Res. 1960 : **21** : No. 4 : 7–10.

A report is given on a study of the grain, semolina and macaroni quality of the recently released varieties Lakota and Wells [cf. 2504] in comparison with Mindum, Ramsey, Langdon and Sentry. Lakota and Wells are considered to be acceptable for milling and processing. Lakota had the lowest test weight but this is probably not a serious defect in view of its high quality in other respects.

3792 Majmudar, J. V. & Majmudar, V. F.
**Improved strains of wheat for the Bhal tract of Gujarat.**
Poona agric. Coll. Mag. 1959 : **50** : 152–54.

Two new selections, Arnej–206, a hard white wheat, and Arnej–624, a hard red wheat, have outyielded the parent strains by 12·5 and 20·9%, respectively, in the very dry Bhal Tract of Gujarat, Bombay State. Both were selected from bulked samples from various regions of the tract.

3793 **Newly licensed varieties.**
Seed Scoop 1960 : **6** : No. 4 : p. 8.

Developed at the Department of Agriculture Research Station, Winnipeg, the new wheats Canthatch (Thatcher[6] x Kenya Farmer) and Pembina [Thatcher x RL2564 (McMurachy-Exchange x Redman[3])] have been licensed in Canada. Except for its resistance to biotypes of stem-rust races 11 and 15B, Canthatch is similar in all respects to Thatcher. Pembina is notable for its good baking quality. In addition, it is earlier and somewhat more resistant to rust than Selkirk.

3794 Riley, R.
**The secondary pairing of bivalents with genetically similar chromosomes.**
Nature, Lond. 1960 : **185** : 751–52.

In investigations undertaken at the Plant Breeding Institute, Cambridge, England, to test the assumption that secondary pairing in allopolyploids takes place between bivalents composed of genetically similar pairs of chromosomes, the material used was developed from three parental lines of Chinese Spring in which chromosomes III, XII and XVI were respectively represented by a pair of telocentrics for one arm, the other arm being absent. Chromosomes III, XII and XVI are known to be homeologous, belonging respectively to genomes B, A and D. The three lines were crossed in pairs to produce $F_1$s with one normal and one telocentric for each of two pairs. Thus, in the cross between the line with III telocentric and the line with XII telocentric, the hybrid had one telocentric member in each of the pairs of III and XII. Pairing between the normal and telocentric chromosomes resulted in the formation of heteromorphic rod bivalents. Only cells having strictly linear arrangements of chromosomes were scored at metaphase I, the scoring recording the number of bivalents intervening between the two heteromorphic pairs. The distribution of the frequencies of cells with the various numbers of intervening bivalents deviated in a highly significant manner from random, the greatest single deviation being in the class with no intervening bivalents. It is pointed out that if, as it seems reasonable to suppose, this departure from random distribution signifies secondary pairing, the results may underestimate normal secondary attraction, since they were based on observations on pairs with telocentric members. The degree of secondary pairing may also have been diminished because the marked bivalents were rods, such bivalents probably moving less freely than ordinary bivalents during metaphase. It is suggested that the chances of secondary association depend upon the relative proximities of homeologues prior to metaphase I. Evidence of secondary pairing between bivalents of III, XII and XVI re-emphasizes the genetical and structural triplication of the chromosomal material in 6*x* wheat and the significance of the role of chromosome V in controlling the formation of bivalents instead of multivalents [cf. XXIX, 1381].

3795 Riley, R., Chapman, V. & Kimber, G.
**Position of the genes determining the diploid-like meiotic behaviour of wheat.**
Nature, Lond. 1960 : **186** : 259–60.

Riley and Chapman [cf. XXIX, 1381] have reported that homeologous pairing was no longer precluded in the absence of the HH chromosome in nullihaploids and 40-chromosome nullisomics of Holdfast, while Sears and Okamoto [cf. XXIX, 1098] have suggested that chromosome V in Chinese Spring is responsible for a decrease in intensity of pairing. Hybrids were obtained between 41-chromosome plants of Holdfast monosomic for HH and Chinese Spring parents in which chromosome V was

represented by a pair of telocentrics for the long arm, the other arm being absent. At meiosis in the 41-chromosome hybrids which had not received the unpaired HH chromosome from Holdfast, 20 normal bivalents were formed, with the chromosome V telocentric as a univalent. Consequently, V and HH must be fully homologous chromosomes and the earlier investigations have revealed the same genetic control of meiotic behaviour. To test the possibility that the gene in question on V is a member of a complementary system, a series of wheat-rye hybrids was developed by pollinating Chinese Spring lines monosomic for I–XXI with rye, a study being made of the 27-chromosome hybrids to which the unpaired chromosome from each wheat parent had not been transmitted. The mean number of trivalents in V-deficient hybrids exceeded the mean number of bivalents in most other hybrids and the number of bivalents was more than three times greater in the absence of V than in hybrids lacking any other chromosome and euploid hybrids. Thus the meiotic isolation of corresponding chromosomes of the different genomes of wheat is due to the activity of V alone, which is restricted to the long arm [cf. XXIX, 1381]. This localization of activity is consistent with the view that a single mutant gene with the observed effect on pairing was selected early in the development of polyploidy in *Triticum*, on account of its influence on fertility and genetic stability. Nevertheless, genes other than the one at the locus on V must influence meiosis, and some may modify regular bivalent formation in one direction or another. Meiosis in wheat may therefore be regarded as being delicately balanced between excessive pairing on the one hand, leading to multivalent formation and genetic instability, and failure of pairing, on the other, leading to univalent formation and aneuploidy.

3796 Di Carlo, V.
Ricerche sull'attività antimitotica della tetraciclina. **(Studies on the antimitotic action of tetracycline).**
Caryologia 1959 : **11** : 382–97.

Grains of *Triticum sativum* 'Garigliano' and bulbs of *Allium cepa* and *Hyacinthus orientalis* were allowed to germinate while floating in solutions of ambramycin (tetracycline hydrochloride) in concentrations varying from 1 : 1,000,000 to 1 : 5000. A marked inhibition of mitosis was observed in the root cells in the more concentrated solutions, the strongest of all being toxic. No mitotic aberrations were observed. A solution of 1 : 5,000,000 stimulated mitosis in onion roots.

3797 Staudt, G.
Untersuchungen an autotetraploidem *Triticum monococcum*. **(Investigations on autotetraploid *T. monococcum*).**
Züchter 1959 : **29** : 341–48.

By treating grains of *T. monococcum* var. *hornemanni* with a 0·025% colchicine solution for 12 hr. a number of plants showing signs of polyploidy were produced and 5 ears selected. The grains of 3 of them contained some tetraploid plants, together with diploids and a certain number of aneuploids with $2n = 27$ and $2n = 29$.

The tetraploid plants in the $C_2$ and $C_3$ generations were shorter and thicker in the straw, which was brittle and suffered more damage from wind than that of the diploids. The number of spikelets per ear was reduced and the ears ripened later; fertility varied but the mean grain number per ear was only 59% of that in the diploids and the grain yield per plant only 50%. No correlation could be found between male and female fertility. The aneuploid plants differed in many features from both $2n$ and $4n$; that with $2n = 27$ reverted to $2n = 28$ in the following generation.

The diploid plants contained 2 pairs of SAT chromosomes at mitosis. The tetraploids had an average of 3·2–3·4 multivalents per cell at meiosis and ring formation and other irregularities were also observed.

The autotetraploids show no resemblance to *T. timopheevi* and lend no support to the assumption of Tumanjan [VIII, 809] that *T. timopheevi* originated from *T. monococcum* var. *hornemanni* by autopolyploidy.

3798 Fedorov, A. K.
**(The development of alternate wheats in connexion with their winter hardiness).**
Fiz. Rasten. (Phys. Pl.) 1960 : **7** : 109–11. [Russian].

The effect of autumnal sowing dates, vernalization and photoperiodic treatments upon the mode of development and winter hardiness of a few alternative wheats was studied at the Institute of Genetics of the Academy of Sciences. Most of these survived the winter frost when sown with nonvernalized seed on 21 September under natural day lengths at Moscow, the hardiest being forms originating from Austria and Czechoslovakia, with 96·4% and 94·2% survivors respectively.

3799 Fedorov, A. K.
**Peculiarities of the development of alternatives in relation to their winter-hardiness.**
Biol. Plant., Praha 1959 : **1** : 295–301.

Under normal conditions of autumn sowing, alternative wheats grew more slowly than spring wheats and this increased their winter hardiness. With spring or summer sowings, prolonged vernalization influenced alternative and spring wheats in a similar way, the development being unaffected in some cases and slightly accelerated in others. With autumn sowing, vernalization caused a considerable increase in the rate of development of alternative varieties, especially Noé and K26191. Development was much accelerated after late summer sowings if the photoperiod was short. Continuous illumination also accelerated the development of alternative varieties after autumn sowing. Prolonged low-temperature treatment changed the reaction of alternative varieties to short day, the treated plants showing less retardation of growth under short-day conditions than untreated plants. Varieties differed in the period of cold treatment required to bring about this change. Spring varieties were affected in a similar way by low temperature but to a lesser degree. Alternative varieties were found to be sensitive to photoperiod for a longer time than spring varieties.

3800 Varis, E.
Syysvehnälajikkeittemme tähkäidäntäherkkyydestä. (**The susceptibility of our winter wheat varieties to sprouting in the ear**).
Koetoiminta ja Käytäntö 1959 : **16** : p. 28.

Comparative data are given for three Finnish varieties and one breeding line, 04819. This line gives the lowest figure of those tested for percentage sprouting in the year, being closely followed by Varma [Sure].

3801 Wu, C.-S. & Chao, T.-F.
**(Studies on the dormancy of the grains of wheat varieties).**
Nung-yeh-hsueh Pao (J. Agric.)/Act. agric. sin. 1959 : **10** : 461–74. [Chinese].

A collection of 374 Chinese varieties is classified into three groups on the basis of length of dormancy period. Many exceptions are noted to the previously reported correlation between short dormancy period and spring habit. However, red kernel coloration is strongly correlated with long dormancy. It is noted that red kernels and the associated long dormancy are more characteristic of the wet climatic zone of southern China than of the more arid north.

3802 Zarubajlo, T. Ja.
**(Some results of work on wheat hybridization).**
Trud. priklad. Bot. Genet. Selekc., Sborn. Puškinskih Lab. (Bull. appl. Bot. Gen. Pl.-Breed. Works of Puškin Lab.) 1958 : No. 1 : 114–27. [Russian].

A number of crosses were made between spring wheats differing in earliness. Part of the $F_1$ in each case was sown in spring and part in autumn; the $F_1$ sown in spring eared at about the same time as the earlier parent and the $F_2$ segregated, 70% of the plants earing at the same time as the early parent and a few before. The $F_2$ from the autumn sowing had very few plants as early as the earlier parent; 15–30% were later than the later parent and 2–4% did not ear at all. In one of the crosses the proportion of awned segregates was greater in the $F_2$ from winter sowing and in all crosses the yield was greater.

The wheat Tulun 70, belonging to var. *graecum* and possessing a number of recessive characters, was pollinated with several pollen parents, by artificial pollination and by leaving emasculated ears in a plot surrounded by plants of the pollen parents, all other ears of the seed parent being removed. In the latter case a greater proportion of fertilizations (28%) proved to have been effected by Lutescens 62 than by other varieties; the lowest proportion was effected by the varieties Albidum 3700 and Velutinum 15045, with 10% each, but the progenies of these two crosses proved higher in yield than those from Lutescens 62. The morphological characteristics of most of the $F_1$ and $F_2$ plants from open pollination were similar to those from artificial crossing but their yield was superior.

Of three plants obtained from crossing Tulun 70 with a pollen mixture from two wheats, Milturum 321 and Meridionale 14446, one combined the awnless character of Milturum 321 with the pubescent glumes and white chaff of Meridionale 14446; segregation occurred in the $F_2$ and $F_3$, where some forms with red chaff appeared. The figures for the segregation of ear colour, awning and pubescence in the $F_3$ show that characters inherited from both pollen parents were being combined.

Tulun 70 and Diamant [Diamond] were crossed with spring wheats from China, Germany and Australia. In the crosses with a late form from

central China, a number of winter forms segregated in the $F_2$. Plants both taller and shorter than the parental extremes occurred in many crosses, the combination Tulun 70 x 31243 from Germany having a particularly high proportion of short-strawed segregates. When $F_1$ plants from different crosses were intercrossed the later generations often showed no segregation at all.

The useful material obtained from the crosses included early-maturing types with large grains, having a 1000-kernel weight of over 50 g.; early-maturing forms with dense ears and short, strong straw; and some very early-maturing winter forms.

3803 Seth, J., Hebert, T. T. & Middleton, G. K.
**Nitrogen utilization in high and low protein wheat varieties.**
Agron. J. 1960 : **52** : 207–09.

A detailed report is provided of investigations on two varieties (Atlas 66 and Selection Y2223–37) with a high and two varieties (Leap and Chancellor) with a low protein content, the main conclusion reached being that varietal disparities in protein content are apparently associated with differences in rate of protein formation in the developing grains [cf. 1422].

3804 Hoshikawa, K.
**Observations on the embryo sac containing double egg apparatus in *Triticum aestivum* L.**
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1960 : **73** : 107–12.

An embryo sac possessing two egg cells, four synergids and two polar nuclei was found with a frequency of about 1 in 300. It is assumed that such an embryo sac arose as the result of a fourth division in megagametogenesis and may be the source of polyembryony.

3805 Evstigneeva, Z. G.
**(The All-Union Conference on the Biochemistry of Grain and Bread-baking).**
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) : Ser. Biol. 1959 : No. 4 : 634–37. [Russian].

This report of a conference held in Moscow in April 1959 mentions in general terms some papers dealing with the breeding of wheat for quality and the technological tests of the grain of different wheat varieties.

3806 Meppelink, E. K.
De bakkwaliteit van de in Nederland verbouwde tarwerassen. Oogst 1958. **(The baking quality of wheat varieties grown in the Netherlands. 1958 harvest).**
Nederlands Graan-Centrum, Wageningen 1959 : 31–43.

Data on the bread-making quality of eight winter and two spring wheats are given.

3807 Refaey, F. Y. *et al.*
**Quality survey of Egyptian wheat crop 1956.**
Government Press, Cairo 1957 : Pp. 61.

The results of analyses of the grain and of the milling and baking qualities of six standard varieties and five new lines are given. Of the latter, four have been named and are to be distributed: Giza 144 (Bahrawi); Giza 145 (Tantawy), Giza 146 (Miniawy) and Giza 147 (Kinawy).

3808 Sibbitt, L. D., Classon, D. H. & Harris, R. H.
**Improved tempering and modified milling techniques for small samples of wheat.**
Cereal Chem. 1960 : **37** : 398–404.

Information is provided on a rotary shaker for tempering and a fast micromilling procedure, use of which permits milling 80 or more 100–150 g. samples per day by one operator in breeding programmes.

3809 Bucur, N., Lixandru, Gh., Teşu, C. & Dumbravă, I.
Toleranţa la salinitate la cîteva soiuri de grîu de toamnă, cultivate neirigat pe soluri salinizate de coastă, şi de luncă din depresiunea Jijia-Bahlui, în condiţiile anului 1958. **(The tolerance to salinity of some winter-wheat varieties grown without irrigation on saline soils along the coast and in the valley bottom of the Jijia-Bahlui depression under the conditions of the year 1958).**
Probl. Agric., Bucureşti 1959 : **11** : No. 10 : 49–54.

A comparative trial of 12 Rumanian varieties showed that Cenad 185 was the most tolerant of high soil salinity.

3810 Nasypajko, V. M.
**(Varietal mixtures of winter wheat).**
Agrobiologija (Agrobiology) 1959 : No. 3 : 335–43. [Russian].

A mechanical mixture of two or three varieties

yielded more grain than the mean of its components grown separately in experiments at Odessa. The productiveness of each component in mixed sowings varied each year, depending mainly on external conditions. This resulted in corresponding increase or decrease of a component in the mixture in later generations. Varietal characteristics such as productive tillering in Odessa 3, or long ears with a proportionate increase of high-grade seed, as in Kawvale, caused only minor shifts in the numerical composition of a mixture. The increased productiveness of a mixture is attributed to its greater environmental plasticity and partly to natural hybridization between its components. Morphological analyses of the plants sown as mechanical mixtures for several successive generations showed that only a small percentage had hybrid characters. For instance, only 1·78% of such plants were found in the mixture of Odessa 3 + Hostianum 237 + Kawvale. But it is thought that the number of hybrids may be higher, as many cannot be identified because of matrocliny.

3811 Kašicina, E. S.
**(Testing varieties of a collection of winter wheat for frost resistance and yield at the Valujsk Research Station for Soil Amelioration).**
Trud. priklad. Bot. Genet. Selekc., Sborn. Puškinskih Lab. (Bull. appl. Bot. Gen. Pl.-Breed. Works of Puškin Lab.) 1958 : No. 1 : 97–106. [Russian].

Irrigation in the autumn greatly increased frost resistance, drought resistance, yield, baking quality and other features, though varieties differed in their individual reactions.

3812 De Carolis, V.
Poca paglia e molto grano? **(Little straw and much grain ?)**
G. Agric. 1960 : **70** : p. 233.

The wheats grown in Italy in the early years of this century were long in the straw and subject to lodging. The first of the strong-strawed short wheats to be produced was Todaro's Inallettabile 96 [Non-lodging 96] and Strampelli produced others such as Ardito [Bold], Villa Glori and Damiano. Those available today do not surpass 50 cm. in height but the author suggests that to grow wheats of this type will lead to a shortage of straw, which is still needed under present conditions of farming in Italy.

3813 Noulard, L.
Note sur le comportement d'une collection de froment de printemps vis-à-vis du charbon nu (*Ustilago nuda tritici* Schaf.). [**A note on the behaviour of a collection of spring wheat towards loose smut (*U. nuda tritici* Schaf.)**]
Parasitica 1959 : **15** : 121–26.

Among about 250 spring wheats tested in Belgium in 1952–57 for resistance to artificial infection with *U. nuda* var. *tritici*, more than 90 varieties of varied geographical origin were highly resistant to the not very virulent smut material used in the tests. The resistant wheats included Jufy I, Phoebus and blé d'Avril [April wheat].

3814 Craddock, J. C. (Jun.)
**Inheritance of the Redman resistance to *Tilletia caries* (D.C.) Tul. and *T. foetida* (Wallr.) Liro.**
Diss. Abstr. 1959 : **20** : LC Card Mic 59–3149 : p. 836. (Abst.).

A study was made of the genetics of smut resistance derived from spring wheat, under conditions of autumn sowing. The resistant, hard red spring wheat Redman was crossed with the winter wheats Elgin, Orfed and Elmar. Elgin is susceptible to all known races, while Orfed and Elmar carry different genes for resistance. Three factors for resistance were detected in Redman but, as regards dominance and recessiveness, these did not necessarily behave similarly in relation to different races. Redman possessed a recessive type of resistance to L–4, attributable to one recessive and two dominant complementary genes for resistance, "with one dominant factor in the susceptible variety Elgin being epistatic to each of the two dominant factors in Redman." The resistance of Redman to race T–1 of *T. caries* was conditioned by one dominant gene, and its resistance to T–6 by two incompletely dominant genes. Its susceptibility to T–13, T–15 and T–16 depended on recessive factors. None of the so-called Martin, Turkey and Rio factors for resistance were present in Redman. $F_3$ data showed the inheritance of smut reaction to be transgressive.

3815 Schaller, C. W., Holton, C. S. & Kendrick, E. L.
**Inheritance of the second factor for resistance to bunt, *Tilletia caries* and *T. foetida*, in the wheat variety Martin.**
Agron. J. 1960 : **52** : 280–85.

The genetics of resistance to race T–1 of *T. caries*

and L–9 of *T. foetida* was investigated in Martin x Elgin, these parents being respectively resistant to both these races and susceptible to all known races of bunt. *M* for resistance to T–1 and $M_2$ for resistance to L–9, both carried by Martin [XXI, 974], were inherited independently. *M* was completely dominant and $M_2$ incompletely dominant. Neither gene affected reaction to the alternate race. One progeny with the genotype $MMm_2m_2$ and two with $mmM_2M_2$, were chosen for additional study. Tests of the reaction of bulk $F_4$ populations of the three lines to each of 25 races of *T. caries* and *T. foetida* showed that *M* conditioned resistance to 15 races and $M_2$ resistance to 5. Both genes were effective in conferring resistance against T–10 and T–11. The genes for virulence in the pathogen with respect to $M_1M_2$ and *H* for resistance appeared to be randomly distributed. The clear-cut specialization of the pathogen in relation to specific genes in the host follows the pattern of the gene-for-gene relationship postulated by Flor for flax rust. It also suggests that the nature of the resistance conferred by each of the genes is specific and distinct. Onas, Baart and Federation appear to have the genotype $mmM_2M_2$, since their reactions to the 25 races were identical with those of the lines with this genotype derived from Martin x Elgin.

3816 Simon, M. & Croisier, L.
Note sur le comportement des variétés de blé à la rouille jaune au cours des années 1954, 1955, 1957. **(A note on the reaction of wheat varieties to yellow rust during the years 1954, 1955 and 1957).**
Ann. Inst. nat. Rech. agron., Paris : Sér. B 1959 : **9** : 435–42.

A new race of *Puccinia glumarum* is reported from northern France. The variety Heine VII was severely attacked while Cappelle-Desprez and Vilmorin 27 were only lightly infected.

3817 Levine, M. N. & Basile, R.
**A review and appraisal of thirty years research on cereal uredinology in Italy.**
Boll. Staz. Pat. veg. Roma 1960 : **17** : 1–32.

The results of work in Italy on the identification of races of *Puccinia graminis* var. *tritici* and *P. rubigo-vera* var. *tritici* in isolates from Italy and other south European countries and from north Africa are surveyed and discussed. With a view to overcoming the problems of cereal rusts on an international cooperative basis, suggestions are made as to the following: (1) the application of some general terms indicating pathogenicity and host reaction; (2) classification of reactions and infection types; (3) calculation of infection means according to a modified graduated conversion scale; (4) the simplification of diagnostic keys; and (5) a formula for estimating the theoretical ultimate number of pathogenic races with which the cereal breeder and pathologist could be confronted, this number depending on the number of reaction classes considered and the actual number of differential hosts.

3818 Basile, R., Leonori-Ossicini, A. & Zitelli, G.
Razze fisiologiche di ruggine nera del frumento (*P. graminis* var. *tritici*) identificate in Italia nel 1958. [**Physiological races of black-stem rust of wheat (*P. graminis* var. *tritici*) identified in Italy in 1958**].
Boll. Staz. Pat. veg. Roma 1960 : **17** : 37–44.

The new data [cf. XXIX, 1419] show that race 21 had diminished in frequency whereas race 34 had increased again. A further race that appears to be new, provisionally designated R50, attacks Khapli and all the other differential varieties with the exception of Vernal.

3819 Salazar Vigil de Quiñones, J.
Ensayo de resistencia, en planta joven, de una colección de trigos, a las razas 14, 17, 19, 21 y 24 de *Puccinia graminis tritici* Eriks. et Henn. **(Test of seedling resistance to races 14, 17, 19, 21 and 24 of *P. graminis tritici* Eriks. et Henn. in a collection of wheats).**
An. Inst. nac. Invest. agron., Madr. 1959 : **8** : 887–95.

Data on the greenhouse reaction of 97 wheats to the above rust races are given in tabular form.

3820 Mohamed, H. A.
**Comparison of the pathogenicity of races 49 and 139 of *Puccinia graminis* var *tritici*.**
Egypt. J. Bot. 1959 : **2** : No. 1 : 29–48.

In addition to 12 standard differential wheat hosts and Lee, 84 wheats were tested for reaction to races 49 and 139 at low and high temperatures. Among these 97 varieties and lines, 44 were resistant, 28 susceptible and the remainder disuniform in response to the two races. Most of the third group were sensitive to tempera-

ture. No differential hosts better than the standards were found among the 84 additional wheats and other cereal varieties tested, although LD53 (*Triticum durum*) and the common wheats Pilot and Ceres were of about the same value as Marquis and Kota. Subraces were identified within each race.

3821 Kaul, R. & Shaw, M.
**The physiology of host-parasite relations. VI. Oxidation-reduction changes in wheat leaf sap caused by rust infection.**
Canad. J. Bot. 1960 : **38** : 399–407.
On the basis of potentiometric analysis of oxidation-reduction changes in the leaf sap extracted from healthy and infected leaves of Little Club (susceptible) and Khapli (resistant), it is postulated that resistance is associated with a rapid and irreversible oxidation of redox systems, whereas susceptibility implies the ability to reverse such oxidation by maintaining an adequate reducing potential. Race 15B of stem rust was used for infection.

3822 Gorja, V. S.
**(The resistance of soft wheat specimens to brown rust depending on the phase of development of the host).**
Dokl. Vsesojuzn. Akad. sel'skohozjajstv. Nauk Lenin. (Proc. All-Un. Lenin Acad. agric. Sci.) 1959 : No. 5 : 34–37. [Russian].
A number of specimens from a collection of wheats were tested for resistance to *Puccinia triticina* at different stages of development in experiments conducted at the Kuban' and Derbent Branches of the Institute of Plant Industry. Most varieties were less resistant at an early stage but became resistant later in the growth period; a few others, in particular the winter wheat Magnif MG from Argentina, were resistant at all stages. Magnif MG gave predominantly resistant progeny in direct and reciprocal crosses with susceptible Novoukrainka 84. Crossing Novoukrainka 84 with a variety which was susceptible at an early stage of development but resistant at a later stage gave only susceptible progeny.

3823 O'Keeffe, L. E., Callenbach, J. A. & Lebsock, K. L.
**Effect of culm solidness on the survival of the wheat stem sawfly.**
J. econ. Ent. 1960 : **53** : 244–46.
A study was made of resistance to *Cephus cinctus* and culm solidity in six hard-red spring wheats differing in degree of resistance but, as graded by the usual techniques, similar as regards solidity. Readings for solidity were recorded from the main stem and a tiller from each of five plants randomly selected from each individual plot. Each culm was cross sectioned at the top and centre of every above-ground internode and an evaluation made of the solidity at the point of the cross section. All readings on an individual culm were averaged to give a culm rating; the main stem and tiller ratings were then averaged to give a rating for the individual plot. Solidity was associated with resistance, as indicated by infestation. The consistently significant differences found between the selections in solidity were most apparent when the readings for the top of the internodes were included with those for the centres in rating a culm. Fertilizer application had very little effect on solidity. With adequate sampling even minor differences in solidity may therefore be shown to exert a significant influence on resistance.

## BUCKWHEAT

3824 Clark, G. M., Baker, D. G. & Heddle, J.
**Dose and dose rate effects of X-irradiation on plants with varying chromosome numbers.**
Canad. J. Genet. Cyt. 1959 : **1** : 142–46.
The effect of X-ray doses of up to 70 Kr. delivered at dose rates varying from 800 to 7178 r./min. on seed germination and plant survival was investigated in diploid ($2n = 16$) and autotetraploid ($4n = 32$) lines of *Fagopyrum esculentum* 'Silver Hull'.
At all doses a greater number of tetraploid seeds germinated. The number of diploid seeds germinating was found to be independent of dose up to 55 Kr. whereas tetraploid seeds showed decreasing germination percentage with increasing dose. The tetraploid seeds showed no dose-rate effect but diploid seeds showed lowest germination at 4350 r./min., percentage germination at this rate being significantly lower than at 800 or 7178 r./min. where minimum effects were observed.
Both $2n$ and $4n$ plants showed a decreasing survival percentage with increasing exposure. Plants grown from tetraploid seed after exposures of up to 50 Kr., however, regularly survived 40 days whereas less than half this dose was fatal to all the diploid plants.

## OATS

3825 Escuro, P. B.
**Relative effectiveness of selection for quantitative traits in $F_2$ of crosses among related and unrelated lines of oats.**
Diss. Abstr. 1959 : **20** : LC Card Mic 59–3743 : p. 1118. (Abst.).

Three related lines and an unrelated variety were crossed in all possible combinations, with the object of comparing the relative effectiveness of selection in the $F_2$ of two groups of crosses: (1) between unrelated and (2) between related parents. Estimates of genotypic variances and heritabilities for six quantitative traits were calculated from the $F_2$ plant and $F_3$ progeny-mean data, while estimates of additive and nonadditive genetic variances and heritability in the narrow sense were made from the variances among and within $F_3$ progenies. Predicted gains were calculated and compared with the observed gains in the $F_3$. Estimates of genotypic variances and corresponding heritabilities were generally higher in the crosses in group (1) for all traits, with the exception of panicle length for which there was no mean difference. High values for additive variance and heritability in the narrow sense were also associated in (1) for date of heading, plant height and seed weight. The mean estimates for panicle length appeared to be essentially of the same magnitude in (1) and (2) if consideration was given to the relatively high estimates obtained for two of the six crosses constituting (2). All of the genotypic variance for date of heading was attributable to additive effects, while the variance for panicle number and grain yield could be ascribed to nonadditive effects, except in one cross in (2). The mean observed gains for all six characters in the $F_3$ were larger in (1) than (2). Selection was effective in raising the means of the $F_3$ progenies of the $F_2$ selections, except for yield in both groups and panicle number in (2). In general, there were good agreements between the mean predicted gains calculated on the assumption of additive gene action and the mean observed gains in the $F_3$ for all characters, if the upward bias due to nonadditive gene effects was considered.

3826 **Oneida oats—new disease-resistant variety.**
Fm. Res. 1960 : **26** : No. 1 : p. 15.

Oneida (Goldwin x Victoria-Rainbow), a mid-season spring oat for New York State, is tolerant of *Septoria avenae* (*Leptosphaeria avenaria*), a disease which has caused severe stem break and lodging in Garry. It has also shown resistance to loose smut and several races of stem rust.

3827 Boteanu, I.
Ovăzul de toamnă ICAR 1. (**The winter oat ICAR 1**).
Probl. Agric., București 1959 : **11** : No. 9 : 13–18.

The above variety was obtained by selection of a mixed population of 13 varieties of *Avena byzantina* and 20 hardy spring oats which had been winter sown for several years at the Moara Domnească research station, Rumania. It outyields the locally grown spring-oat varieties.

3828 **New red oat.**
Agric. Res., Wash. 1960 : **8** : No. 7 : p. 15.

Curt, a short-strawed red oat adapted for hay, pasture and grain production in California, was developed at the Agricultural Experiment Station, Davis, from a cross between Kanota and a nullisomic. Although only about 60% as tall as other varieties, it shows no reduction in hay production and has a superiority of about 25% in grain yield. It is resistant to lodging, shattering, yellow dwarf and stem rust.

3829 Majdannik, A. S.
(**Open intervarietal hybridization of oats**).
Agrobiologija (Agrobiology) 1959 : No. 3 : 460–62. [Russian].

This report on breeding oats at Mironovka mentions hybrid families of Soviet, Bolshevik and Kiev from restricted open pollination by other specially chosen varieties. Data showing the economic characteristics of selected families, now in their fifth and seventh generations, are provided. All these outyielded the mother variety and have larger grain and lower husk content. Some families derived from Bolshevik belong to botanical variety *aurea*, the mother variety being *aristata*, while most other families are the same varieties as the initial form.

3830 Charlanes, M.
Différence de comportement de quelques variétés d'avoine (*Avena sativa* L.) en présence de manganèse soluble et insoluble. [**Difference in behaviour of varieties of oats (*A. sativa L.*) in the presence of soluble and insoluble manganese**].
CR Acad. Sci., Paris 1960 : **250** : 3713–15.

In pot experiments, Scotch Potato, Grand Mogul and Muligrap all increased their productivity with increasing amounts of soluble Mn

(0–0·3 μg./l.) added to the soil. In the absence of Mn or when insoluble Mn was added, Scotch Potato was best.

3831 Frey, K. J., Murphy, H. C., Petr, F. & Norden, A. J.
**Lodging resistance studies in oats. III. Optimum number of plots and samples for $cL_r$ and snap scores.**
Agron. J. 1960 : **52** : 289–91.

The coefficient of variation for $cL_r$ (lodging-resistance factor) readings was respectively 36% and 47% in two tests but only 12% for the snap method [cf. XXIX, 1441 and XXX, 1471]. To obtain the same degree of precision, a smaller number of replications and samples would therefore be necessary for the snap test than for the $cL_r$ method. Cost per plot for either method was the same but cost per sample was twice as great for the $cL_r$ method as for the snap test. With a degree of precision equal to $\sigma^2\bar{x} = \cdot 08\bar{x}$, the cost per entry in measuring lodging resistance by the snap method was only one-third that entailed by the $cL_r$ method. The data in this series of papers have led to the conclusion that, when a progeny row 2 ft. or more in length can be grown, the snap-score method is the best artificial means of evaluating lodging resistance in oats.

3832 Turner, E. M. C.
**An enzymic basis for pathogenic specificity.**
Nature, Lond. 1960 : **186** : 325–26.

Evidence has been obtained that in oats resistance to *Ophiobolus graminis* depends upon an antibiotic (avenacin), while susceptibility to *O. graminis* var. *avenae* is due to the production of inactivating enzyme (glucosidase) by the pathogen. Var. *avenae* may therefore have arisen through mutation to the capacity for glucosidase production, although such a mutation would only be effective in a mycelium which maintained the environment in a state of low oxidation.

3833 Clark, R. V. & Drayton, F. L.
**The pathogenicity of isolates of *Septoria avenae* f. sp. *avenae*.**
Canad. J. Bot. 1960 : **38** : 103–10.

Greenhouse studies on the degree of pathogenicity of three collections of isolates of *Septoria avenae* (*Leptosphaeria avenaria*) f. sp. *avenae* on six oat varieties, Abegweit, Lanark, Rodney, CD4090, CD5924 and an Ottawa hybrid selection 5055–46, are reported. All the isolates were pathogenic on the test varieties but varied greatly in virulence. This variability was found even among isolates from a single leaf lesion. The oat varieties did not react differentially and it was not possible to demonstrate racial differences between isolates.

3834 Zillinsky, F. J. & Derick, R. A.
**Crown rust resistant derivatives from crosses between autotetraploid *Avena strigosa* and *A. sativa*.**
Canad. J. Pl. Sci. 1960 : **40** : 366–70.

$F_1$ hybrids were obtained from $4x$ *A. strigosa* x *A. sativa* 'Abegweit' and 'Victory'. Seeds were secured only by open pollination of the $F_1$ and succeeding generations, selfing or back crossing being unsuccessful. Chromosome numbers in the $F_3$ and $F_4$ ranged from $2n = 37$ to 42. The chromosome number of the more fertile plants approached 42 but some individuals with $2n = 42$ were only partially fertile. Hexaploids with resistance to races 264, 274 and 290 of crown rust, a characteristic of *A. strigosa*, were obtained from the $F_4$ and $F_5$. They resembled *A. sativa* in most features and were readily crossable with common oat varieties, giving fertile and resistant segregates.

3835 Sanderson, K. E.
**Inheritance of reaction to several races of crown rust, *Puccinia coronata avenae* Erikss., in two crosses involving Ukraine oats.**
Canad. J. Pl. Sci. 1960 : **40** : 345–52.

According to data from Fortune x Ukraine and Garry x Ukraine, Ukraine carried one dominant gene for resistance to races 213, 202, 202A, 209, 212A, 235, 236, 239, 239B and 240, and another dominant gene for resistance to race 263, which is pathogenic on almost all commercial oat varieties in North America. The resistant reactions of Garry to races 229, 235 and 240 were genetically associated, as were its resistant reaction to races 209, 236 and 239. One or more genes in Garry governed resistance to each of these groups, but whether or not the same gene or genes conditioned resistance to both groups was not ascertained. The crown-rust reactions of Ukraine and Garry were inherited independently, with the gene for the higher type of resistance of Ukraine epistatic to the gene for lower type possessed by Garry. $F_3$ lines, thought to have value for breeding, were isolated which combined the field resistance of Ukraine and Garry to crown rust, including race 263, with the field resistance of Garry to stem rust.

3836 Welsh, J. N.
**Ten year Report on oat breeding at the Cereal Breeding Laboratory, Canada Department of Agriculture Research Station, Winnipeg.**
Cereal News 1960 : Pp. 17.

A review is given of work on the following: study of introductions; testing experimental strains for yield; breeding for resistance to crown and stem rust; inheritance of resistance to races of these two rusts; and the cytogenetics of fatuoid off-types of Garry. Three varieties were distributed during the period under review: Garry, Rodney and Vicar. Although not conclusive, data obtained on fatuoids favour the hypothesis that these arise by natural crossing between *Avena fatua* and cultivated oats. Depth of the crease on the ventral side of the caryopsis is heritable, as indicated by an analysis of crosses involving *A. fatua*, Garry, Eagle and fatuoid Garry. Caryopses of *A. sativa* and fatuoids have a deep crease whereas those of *A. fatua* have a shallow one. The crease is a useful character for differentiating between a fatuoid and wild oat. The inheritance of other characters, such as plant type, grain colour and rachilla, basal and lemma pubescence was also investigated in these crosses.

3837 Chang, T.-T.
**Analysis of genes conditioning resistance of oat varieties to races of *Puccinia coronata* Cda, var. *avenae* F. and L.**
Diss. Abstr. 1959 : **20** : LC Card Mic 59–3737 : 1133–34. (Abst.).

Recent revision in the system of identifying and numbering races of the above pathogen has affected the applicability of previous information on the inheritance of resistance, based on tests with races identified in the former series. Seventy-eight crosses among 14 varieties were tested with four races (203, 216, 258 and 276) in the new series. The following modes of inheritance of reaction are postulated for the nine resistant varieties analysed. (1) Ascencão carries two dominant, independent genes (*V*, *E*), singly or jointly controlling resistance to races 203 and 258. *V* confers moderate resistance to 276 and is ineffective against 216. *E* governs resistance to 216 and is hypostatic to a dominant inhibitor ($I_E$) present in certain varieties susceptible to this race. (2) Moravia, 64Q and Victoria all possess *V*, imparting moderate resistance to races 203, 258 and 276; they also contain $I_E$. (3) Bond carries $b_R$ for resistance to 258. *B* and *b* determine susceptibility to this race, the dominance relationship within this allelic series being $B > b_R > b$. Allele $b_R$ is also hypostatic to the dominant inhibitor $I_b$ found in some varieties susceptible to 258. (4) A partially dominant gene, *L*, conditions resistance to 203, 216 and 258 in Landhafer. (5) Data from crosses of Santa Fe with susceptible varieties suggested that a single gene, *S*, controls resistance to 203, 216 and 258. Crosses between Santa Fe, Bagé and Trispernia, all resistant varieties, offered evidence that, in addition to *S*, Santa Fe also carries *M* and *U* for resistance. The three genes appeared to be linked. (6) *U* confers moderate resistance to 203 and 258 and *M* moderate resistance to 216 upon Bagé. (7) In Trispernia, three independent genes, *R*, *T* and *U*, controlled moderate resistance to 203; *M* conditioned resistance to 216 and *U* resistance to 258.

"Each of the five susceptible varieties is postulated to have the recessive alleles of the 'E', 'L', 'M', 'R', 'S', 'T', 'U' and 'V' genes, respectively." Criolla Saltena and Gopher also contain $I_E$, $I_b$ and *B*, and De Argelia and Dom Pedrito both these inhibitors and *b*. La Previsión appeared to have only $I_b$.

3838 Sadanaga, K. & Simons, M. D.
**Transfer of crown rust resistance of diploid and tetraploid species to hexaploid oats.**
Agron. J. 1960 : **52** : 285–88.

Hybrids were readily obtained from the following: (1) CI7232 (tetraploid derived from *Avena abyssinica* x *A. strigosa* and formerly designated Abd. 101) x *A. sativa* [cf. XXIX, 3767]; (2) autotetraploid CI3815 (*A. strigosa*) x *A. sativa*; and (3) CI7233 (*A. abyssinica*) x *A. sativa*. Amphidiploids ($2n = 70$) were produced from the $F_1$ of (3). No mature plants were secured from crosses between synthetic hexaploids and *A. sativa*, only 2 seeds being obtained from 236 pollinations. Progenies from (1), (2) and (3) were tested at the seedling stage with crown-rust races which attack Landhafer but not the $2x$ and $4x$ parents involved. Races 264, 276 and 290 were used. The resistance of *A. strigosa*, transferred to CI7232, has been carried to the $BC_4$, with *A. sativa* as recurrent parent, and $F_4$ lines apparently homozygous for resistance have been secured from $BC_3$ plants of (1). Individuals taken from lines homozygous for resistance had $2n = 42$ or 43. The monogenic resistance of CI3815 was carried to the $BC_2$, while the monogenic resistance of CI7233 was

transferred to the $BC_3$. Seed set in the $BC_1$ and $BC_2$ of the $F_1$ hybrids and amphidiploids derived from (3) was low but was higher in back crosses involving the latter. Selection of seedlings carrying the gene for resistance from CI7233 was more difficult than selection of resistant seedlings derived from (1) and (2), because many of the progenies, presumably heterozygous for the gene for resistance from CI7233, showed moderately susceptible to susceptible reactions.

3839 Hooker, A. L.
**Sources of resistance to the Septoria disease of oats.**
Agron. J. 1960 : **52** : 137–38.

A large number of oat varieties and selections were evaluated for resistance to *S. avenae* (*Leptosphaeria avenaria*) in three regions of Wisconsin. While most of the oat strains are deficient in one or more other desirable characteristics, they provide promising source material for use in breeding resistant commercial varieties. Among the named varieties included in these tests, Ajax, Clintafe, Clintland, Clinton, Craig, Gopher, Kanota, Mohawk, Roxton and Victory had the lowest combined leaf, stem and kernel infection scores.

3840 Hooker, A. L.
**Inheritance of reaction to *Septoria avenae* in oats.**
Agron. J. 1960 : **52** : 139–43.

The inheritance of reaction to *S. avenae* [*Leptosphaeria avenaria*] was studied in the $F_2$, $F_3$ and $F_4$ progenies of a number of resistant x susceptible oat crosses. Reaction was found to be inherited quantitatively and to be influenced by environment. There were indications that resistance to *S. avenae* and earliness might be combined.

3841 Luke, H. H., Wheeler, H. E. & Wallace, A. T.
**Victoria-type resistance to crown rust separated from susceptibility to *Helminthosporium* blight in oats.**
Phytopathology 1960 : **50** : 205–09.

Two mutants resistant to *H. victoriae* were isolated from the variety Fulgrain and tested for reaction to *Puccinia coronata* var. *avenae*. The results were compared with those of the parent variety and Victoria. All showed a similar resistance reaction to races 202 and 203. Victoria and Fulgrain however exhibited greater resistance to races 205 and 290 than did the mutants.

It is concluded that the gene controlling resistance to crown rust is not the same as that controlling susceptibility to *Helminthosporium* blight but that a complex locus as suggested by Konzak [cf. XXVIII, 194] may be involved.

3842 Davies, T. G.
**A spring oat variety resistant to the stem eelworm.**
Nature, Lond. 1960 : **186** : p. 813.

Manod [cf. 2443] showed a high degree of resistance to *Ditylenchus dipsaci* in a variety trial in Denbighshire, Wales.

## RYE

3843 Meurman, H.
Rukiin lajikekokeet Karjalan koeasemalla Anjalassa. (**Rye variety trials at the Karelian experimental ground at Anjala**).
Koetoiminta ja Käytäntö 1959 : **16** : p. 26.

A number of varieties have been tested against Toivo [Hope] as standard in respect of yield, winter hardiness and resistance to lodging. The only variety to exceed the standard in yield was Visa [Curly]. Winter hardiness was as great in Toivo as in the others, Diva [Splendid], Onni [Fortune] and Ensi [First] also giving good results. All varieties tested, in particular Pekka and Visa, showed greater resistance to lodging than the standard.

3844 Lundqvist, A.
**The origin of self-compatibility in rye.**
Hereditas, Lund 1960 : **46** : 1–19.

Data collected during 1919–27 by N. Heribert Nilsson are published by the present author, who analyses them according to his own hypothesis of the genetics of self incompatibility in rye [cf. 1480]. Ability to set selfed seed when bagged was studied in four diploid commercial varieties. Petkus ($I_0$–$I_5$) constituted the chief material. In the main, the results agreed with those derived by the author from Steel, which involves Petkus in its ancestry. Self-sterile individuals predominated in the initial outbred populations ($I_0$). Ability to set seed by selfing was clearly heritable but selfed offspring with a high selfed seed set (above 20%) were recovered from parents with both high and low (0–5%) self fertility. Proportionally, more selfed offspring with above 20% set were recovered from the lowest than from the next to lowest parental class. It was therefore concluded that segregation of modifiers affecting the self-incompatibility reaction was of little consequence. The introduction, by parental self gametes, of "new factors conferring self-compatibility and directly

involving the incompatibility loci" was therefore considered. The frequency of offspring with high selfed set from the lowest parental class decreased as the parents were more inbred. It was concluded that inbreeding depression was not the main cause of this reduction but that the frequency of selfed offspring with high self fertility was dependent, at least partly, upon the degree of parental heterozygosity. "The lower rate of new factors for self-compatibility in the less heterozygous series indicated that, at least in part, these factors were due to recombination. The implications of recombination within an incompatibility locus operating to produce factors for self-compatibility are discussed. With the two-loci system which operates in rye, equal recombination is not considered to lead to lack of formation of incompatibility substances but to new specificities, and self-compatibility would rather indicate the lack of coordination between the substances formed in pistil and pollen. Within the incompatibility locus two regions that determine specificity are made probable, one for the pollen, the other for the pistil. Recombination within the incompatibility locus leading to separation of these two complementary regions will also lead to disorganization of this system."

3845 Salminen, M.
**(The phenomenon of heterosis in rye).**
Koetoiminta ja Käytäntö 1959 : **16** : p. 27.

Seed obtained from the varieties Visa [Curly] and Vjatka which had been open pollinated showed in the case of Vjatka an increase in grain yield of 10–15% over that of pure Vjakta, and in Visa an increase of 12–19% over that of pure Vjatka. Straw yields similarly increased. Such hybrid varieties have also shown themselves vigorous but a difference in winter hardiness has so far not been observed.

3846 Surikov, I. M.
**(Grain weight and form development in inbred rye).**
Učen. Zap. belorussk. Univ. (Sci. Mem. White Russ. Univ.) 1957 : No. 37 : 213–22 : from Ref. Ž. (Ref. J.) 1958 : No. 19 : Abst. 85640 : p. 35. [Russian].

The size of grain in the $I_1$ of Vjatka and Petkus was the same as that of open-pollinated plants of these varieties, but in the $I_2$ it was noticeably smaller. Self-fertile genotypes tended to set more grains and to form larger grains on selfing. Considerable reductions in seed viability were observed in the $I_1$ and $I_2$; albinos segregated. Other segregates included self-fertile forms, dwarfs and plants with long ears or long firm straw.

3847 Surkov, V. A.
**(The tillering characteristics in plants of the winter-rye variety Vjatka which had completed the vernalization phase at a high temperature).**
Fiz. Rasten. (Phys. Pl.) 1959 : **6** : 592–97. [Russian].

Plants of Vjatka were induced to form an increased number of tillers and branched ears with greater number of spikelets, flowers and grains by vernalization at 2° C. for 40 days, followed by transference to a field well dressed with NPK for completion of the vernalization phase at a higher temperature. The changes are thought to be heritable and the above method is recommended for breeding high-yielding branched-eared forms of rye and other cereals.

3848 Krasnjuk, A. A.
**(The breeding of the rye Saratovskaja Krupnozernaja).**
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1959 : No. 3 : 41–47. [Russian].

Saratovskaja Krupnozernaja [Saratov Large-grained] was obtained by open pollination of Volžanka [rye from the Volga] with large-grained forms introduced from Belgium, Yugoslavia, the Baltic republics and other countries. A scheme of further selection of the new variety, which has large grain, long ears and good baking properties, is presented. In recent trials it has consistently outyielded Volžanka by at least 2 c. per ha.

3849 Jain, S. K.
**Cytogenetics of rye (*Secale* spp.).**
Bibliogr. genet. 1960 : **19** : 1–86.

This review contains an extensive chapter on the cytology of rye, a less extensive one on genetics and two brief chapters on systematics and the origin of cultivated rye. Topics surveyed in the chapter on cytology are: the caryotype; meiotic studies; accessory chromosomes; haploidy and polyploidy; interspecific hybridization; and intergeneric hybridization.

3850 Breslavec, L. P. & Mileško, Z. F.
**(The defence of plants from ionizing radiation).**
Priroda (Nature), Leningrad 1960 : No. 5 : 50–53. [Russian].

Rye tetraploids were invariably superior in

resistance to sublethal neutron treatments, as shown by initial growth. Differences in this respect between the tetraploids and diploids were more noticeable as the doses increased. The superior resistance of the tetraploids was also apparent from the lower percentages of defective pollen after treatments with $\gamma$ rays.

3851 Cicin, N. V. & Mahalin, M. A.
**(A polyploid rye with branched ears).**
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1960 : **131** : 1165–67. [Russian].

The seed of a winter rye with branched ears which had been bred some years previously by the senior author was treated with 0·3% colchicine solution for 24 hr. The resulting polyploid with $2n = 28$ showed improvements in ear length and 1000-grain weight by comparison with the initial diploid form and its grain had a higher protein content. However it produced fewer tillers and set less grain than the diploid, though some of the polyploid plants bore as many as 80 grains in an ear. Work on the selection of plants with a good grain set is in progress.

3852 Šerstova, K. N.
**(An experiment on changing spring into winter rye in conditions of the Jakutian ASSR).**
Agrobiologija (Agrobiology) 1959 : No. 3: 378–84. [Russian].

Several spring-rye varieties, grown for a few successive generations as a winter crop in Jakutia, acquired a winter habit. The best of them were those derived from Mestnaja Uluščennaja [Improved Local] and Onohojskaja; they had larger grain and were more productive than the spring standard Sitnikovo. Improvement of these forms by mass selection and the training of other spring varieties for the winter habit are in progress.

3853 Ostanin, A. M.
**(Developing winter or spring habit in biologically different forms of rye).**
Agrobiologija (Agrobiology) 1959 : No. 3 : 385–93. [Russian].

Experiments on changing spring rye into winter rye at the Burjat Agricultural Research Station showed that sowing the spring variety for one year as a winter crop shattered its heritable basis and that upon sowing in the autumn for another year it acquired the winter habit. The climatic conditions were less favourable to shattering the winter habit and a winter-rye variety had to be sown twice as a spring crop before its heritable basis was shattered and it gave rise to spring forms after the third and later generations were grown as spring ryes. The periods required for changing the winter or spring habit were not shortened by using hybrid seed of winter rye ♀ x spring rye ♂ in the case of winter rye trained for spring habit and of spring rye ♀ x winter rye ♂ in that of spring rye trained for winter habit.

3854 Surykaj, G. M.
**(Self fertility of a rye population).**
Izv. Akad. Nauk belorussk. SSR : Ser. biol. Nauk (News Acad. Sci. White Russ. SSR : Ser. biol. Sci.) 1956 : No. 4 : 55–76 : from Ref. Ž. (Ref. J.) 1958 : No. 19 : Abst. 85644 : p. 35. [White Russian].

The degree of self fertility of a rye population was fairly constant over different years, forms with good grain sets on selfing being found within the populations. Isolating inbreds for more than a generation improved their self fertility, this being attributed to natural selection for self fertility. Self fertility was most pronounced in the central portion of the ear. The population studied comprised self-sterile and self-fertile genotypes in the ratio 2 : 1. Lines that were highly self fertile gave segregates characterized by a low degree of self fertility. Open-pollinated progeny of a self-fertile genotype gave a 2 : 1 ratio of sterile to fertile ears.

3855 Hudjak, M. I.
**(The effect of self pollination upon the development of rye endosperm).**
Ukrajin. bot. Ž. (Ukrain. J. Bot.) 1959 : **16** : No. 4 : 67–73. [Ukrainian].

Cytoembryological studies in the Ukraine showed that absence of fertilization was the chief cause of self sterility in rye. Self fertilization, when it occurred, only retarded the embryological processes, without upsetting the normal development of the caryopsis, though sometimes selfing gave rise to caryopses in which the development of all tissues finally ceased at an early stage.

3856 Aguado Marín, M. & Martínez Vázquez, M.
Estudio morfológico y anatómico de los centenos españoles. **(Morphological and anatomical studies of Spanish ryes).**
Inst. Nac. Invest. Agron., Madrid 1959 : Pp. 227.

Detailed studies of the morphology and anatomy of the root, leaf, stem, inflorescence and caryopsis

of rye are presented. Observations on root-tip mitosis and pollen-mother-cell meiosis are also recorded.

3857 Surkov, V. A.
**(The origin and nature of branched ears in the fields of ordinary varieties of cereals).**
Fiz. Rasten. (Phys. Pl.) 1959 : **6** : 82–85. [Russian].

The rye Vjatka was experimentally induced to form branched ears or ears with a greater number of florets than normal at Smolensk. The method consisted of raising plants from grain whose heritable basis had been shattered by subjecting it to a high temperature at the end of the vernalization period and growing these plants on well-fertilized soil. The progeny comprised plants mostly with 5–6 florets, while a few plants had branched ears and a few were normal.

3858 Andrews, J. E.
**Cold hardening and cold hardiness of young winter rye seedlings as affected by stage of development and temperature.**
Canad. J. Bot. 1960 : **38** : 353–63.

Intervarietal genetic differences in cold hardiness corresponding with those obtained in the field were established by hardening seedlings for 7 weeks at 1° C. and subsequent exposure to −15° C. for 16 hr. or by hardening for 5 weeks at 1·5° C. and exposure to −14° C. for 16 hr. Survival counts were made about 2 weeks after freezing.

## MAIZE

3859 Lappo, A. I. & Žuravel', B. N.
**(Maize breeding in White Russia).**
Kukuruza (Maize) 1959 : No. 5 : 23–25. [Russian].

Voronež 80 and other midseason and early varieties productive of leafy stems and grain are regarded as the forage types most adapted to White Russian climatic and soil conditions. Others include Dutch and Canadian inbreds, local forms tolerant of frost and intervarietal hybrids between midseason types from different districts.

3860 Čoboni, H., Ljačej, H. & Praksin, S.
**(Maize in Albania).**
Zemledelie (Agriculture) 1959 : No. 6 : 89–92. [Russian].

Information on the grain yields of nine Albanian land varieties for the period 1953–1956 is provided. In 1957 and 1958 the above varieties were outyielded by introduced hybrids or Deti x Bulgar and other intervarietal hybrids bred in Albania. The double cross VIR 42 [Institute of Plant Industry 42] outyielded all other hybrids at most places.

3861 Torge, D., Cosmin, O., Butică, A., Dumitrache, V. & Munteanu, O.
Repartizarea teritorială pentru anul 1960 a soiurilor şi hibrizilor de porumb în R.P.R. **(Territorial distribution of varieties and hybrids of maize in the Rumanian People's Republic for the year 1960).**
Probl. Agric., Bucureşti 1960 : **12** : No. 3 : 5–19.

Extensive details are given on the productivity, yield components, chemical composition of the grain and hectolitre weight of 37 varieties and hybrids tested in 1957–59 and recommendations on suitable forms for each region of Rumania are made for 1960.

3862 Homenko, A. A.
**(Maize breeding in the Kulunda steppe).**
Kukuruza (Maize) 1959 : No. 5 : 25–26. [Russian].

This report on maize breeding at Slavgorod mentions a new variety Urožajnaja [Productive] which yields 11·2 c. more grain per ha. than Slavgorod 270. Also mentioned are Sterling x Urožajnaja, Dnepropetrovsk x Pervenec [Firstborn] and other hybrids productive of nutritious forage. All hybrids were obtained by fertilizing an introduced tall variety with the pollen from an early local form. Reciprocal crosses were unsuccessful as these hybrids had the undesirable sturdy habit of the maternal parent.

3863 Tomoroga, P., Lupu, A., Ţucra, I. & Nicolae, C.-Ţ.
Măsuri agrotehnice corespunzătoare culturii porumbului în Dobrogea. **(Agrotechnical measures appropriate for maize cultivation in Dobrogea).**
Probl. Agric., Bucureşti 1959 : **12** : No. 4 : 32–41.

This article includes some results of variety trials of hybrid maize at the Val Traian research station.

3864 Moll, R. H., Robinson, H. F. & Cockerham, C. C.
**Genetic variability in an advanced generation of a cross of two open-pollinated varieties of corn.**
Agron. J. 1960 : **52** : 171–73.

The $F_3$ population of a cross between the maize

varieties Jarvis and Indian Chief was compared with the two varieties and their $F_1$. The additive genetic variance for grain yield was greater in the $F_3$ than in either of the parental varieties or their $F_1$, and it is concluded from predictions based on the estimates of additive genetic variance that one cycle of selection should offset the disadvantage in mean performance which was observed in the advanced generation material.

3865 Peterson, P. A.
**The pale green mutable system in maize.**
Genetics 1960 : **45** : 115–33.

The results of the investigations on mutation of $pg^m$ (seedlings with dark-green stripes on a pale-green background) to *Pg* (normal green seedlings) under the influence of the system *En* (Enchancer)–*I* (Inhibitor) have already been reported by the author in an abstract [cf. XXIV, 1930]. *I* at locus *Pg*, it is postulated, inhibits expression of the normal allele and *En* inactivates *I* or causes its removal. The present paper also gives information on a new mutable allele ($pg^{mo}$) at the same locus. Seedlings of the $pg^{mo}$ mutant have indistinctly outlined stripes, in contrast to the clear-cut ones characteristic of $pg^m$ seedlings. In the case of mutation of $pg^m$ to *Pg*, *En* may be situated at the locus (autonomous control) or apart from it (independent control). Mutability of $pg^{mo}$ was of the autonomous type. The inhibitor associated with $pg^{mo}$ had only a partial effect. The *En–I* system is discussed in relation to other two-part systems controlling mutability in maize and involving transposition of components. *En* appears to arise at locus *Pg* in the presence of *I*; this relationship may offer a clue to the individual specificity of two-part systems. It is further pointed out that both the specificity of control and origin of the second member of the system investigated are reminiscent of antibody-antigen relationships.

3866 Oberdorf, F. & Winkel, A.
Die Erzeugung von Maishybriden in der DDR. (**The production of maize hybrids in the German Democratic Republic**).
Dtsch. Landw., Berl. 1960 : **11** : 224–25.

Mention is made of the testing of foreign hybrids and the production of new hybrids, breeding aims being discussed. The cross W802 (Schindelmeiser x VIR 25 [Institute of Plant Industry 25]) has proved satisfactory; it appears to be superior to the parents in every respect and is particularly suitable for ensilage. This cross is relatively easy to effect.

3867 Fenaroli, L.
I nuovi ibridi IAB 300 e Insubria 295 nelle prove di orientamento e dimostrative della campagna 1959. (**The new hybrids IAB300 and Insubria 295 in preliminary and demonstration tests in the 1959 season**).
Maydica, Bergamo 1960 : **5** : 37–39.

Both hybrids [cf. XXIX, 2574] continued to occupy the top places in 1959, which was a favourable year for maize on account of the high rainfall, their mean yield of grain being 40 c. per ha. in central and southern Italy, as against 25 c. for the local varieties.

3868 Fenaroli, L.
La produzione delle sementi ibride di mais in Italia con particolare riguardo all'esportazione. (**The production of hybrid maize seed in Italy with particular regard to export**).
Maydica, Bergamo 1960 : **5** : 40–44.

Figures presented show that 31% of the Italian maize area is now under hybrids, the increase in yield being estimated as 8½ million centners. The Italian climate makes it possible to produce seed of all classes from 200 to 900, as well as sweet and pop corns and forage maizes.

3869 Lucenko, A. M.
(**At the Gor'kij research station**).
Kukuruza (Maize) 1959 : No. 6 : 30–31. [Russian].

The top crosses Uspeh [Success] and Dneprovsk, from crosses of Dnepropetrovsk and Har'kovskaja Belaja Zubovidnaja [Har'kov White Dent] respectively, with the selfed line Gruševka 380 showed heterosis for earliness and yield by comparison with their mother parents. Mention is made of new heterotic hybrids from Gor'kij which yield 21–36% more forage than their ♀ parent.

3870 Wu, S.-K.
(**The utilization of hybrid vigour in increasing maize production in the new China and its future prospects**).
Nung-yeh-hsueh Pao (J. Agric.)/Act. agric. sin. 1959 : **10** : 360–67. [Chinese].

Maize breeding in recent years in China is briefly reviewed. Till now, intervarietal hybrids have been principally employed. Recently, however, synthetic varieties and hybrids between inbred lines have been investigated.

3871 Gerasenkov, B. I.
**(Maize breeding in Siberia).**
Kukuruza (Maize) 1959 : No. 3 : 35–37. [Russian].
This report on breeding maize at Omsk mentions new varieties which are more productive of grain and forage than Belojaroe Pšeno [White-spring Millet], without having an appreciably longer growth period. All of them produce ears higher above the ground than Belojaroe Pšeno. Omsk 806 was selected from Alan; the others are hybrid populations. Omsk 1 and Omsk 2 were built up from local Siberian material, while Omsk 8 and Siberian 30 involved some varieties originating from other geographical districts of the USSR.

3872 Leng, E. R. & Ross, G. L.
**Performance of commercial corn hybrids in Illinois, 1959.**
Bull. Ill. agric. Exp. Sta. 1960 : No. 651 : Pp. 48.
A report is provided on tests of 523 commercial hybrids at ten centres.

3873 Jugenheimer, R. W., Williams, K. E. & Harrison, R. L.
**Performance of experimental corn hybrids in Illinois, 1959.**
Bull. Ill. agric. Exp. Sta. 1960 : No. 652 : Pp. 48.
The results of trials of (1) double crosses, (2) three-way combinations, (3) high-oil and high-protein hybrids and (4) crosses involving related inbreds are reported.

3874 Hutchcroft, C. D., Robinson, J. L. & Ingledue, R. D.
**The 1959 Iowa corn yield test.**
Bull. Ia. Univ. Sci. Tech. 1960 : No. P–128 : Pp. 20.
Information is given on the performance of many commercial hybrids grown in Iowa.

3875 Resumen de ensayos con maíz híbrido en España. **(Summary of trials of hybrid maize in Spain).**
Inst. Nac. Invest. Agron., Madrid 1958 (1959) : unpaginated. (Mimeographed).
Data on days to silking, days to harvest, percentages of broken and lodged plants, plant height, ear height, yield, incidence of borers and smut and other characters are given for numerous hybrids tested in various localities in Spain in 1958.

3876 Mission "maïs" en Belgique. **(Maize mission in Belgium).**
Bull. tech. Ing. Serv. agric. 1960 : No. 146 : 31–39.
The new Franco-american maize hybrids INRA 200 and INRA 244 [cf. 3885] have given good results in preliminary trials in Belgium.

3877 Dančev, S.
**(Masters of hybrid seed production).**
Kooper. Zemed. (Cooper. Fmg.), Sofija 1959 : No. 4 : p. 27. [Bulgarian].
The production of hybrid maize seed at Kamenec, Pleven province, is reported. In trials of hybrids VIR 42 was the most productive with Wisconsin 692 as the runner-up.

3878 Lenkov, L. & Dimova, R.
**(The productivity of some American maize hybrids).**
Kooper. Zemed. (Cooper. Fmg.), Sofija 1959 : No. 4 : 32–33. [Bulgarian].
Single crosses WF9 x N6 and Ny x OH–7 and the double cross Ohio S92 were the most productive of the hybrids tested at the Dimitrov Agricultural Institute under drought conditions in 1958. WF9 x N6 had the shortest growth period and US13 the longest.

3879 Căbulea, I. *et al.*
Comportarea hibrizilor dubli de porumb în anii 1957 și 1958 la Stațiunea Experimentală I.C.C.P.-Turda. **(The behaviour of double maize hybrids in the years 1957 and 1958 at the ICCP-Turda Experimental Station).**
Probl. Agric., București 1959 : **11** : No. 10 : p. 103. (Abst.).
As the result of the trials referred to above, hybrids are recommended for the zones of adaptation in Transylvania of the varieties Galben timpuriu [Early Yellow], Arieșan timpuriu [Early maize from Arieș] and Arieșan.

3880 Kozubenko, V.
**(The maize hybrid Bukovina 3).**
Nauk. pered. Opyt sel'sk Hozjajstv. (Sci. progr. Exp. Agric.) 1959 : No. 4 : 36–38. [Russian].
Bukovina 3, a top cross of Glorija Janeckogo [Janeckij's Glory] x inbred VIR 44 [Institute of Plant Industry 44], has outyielded VIR 25 and other high yielding varieties in recent trials. Its other valuable characters include cold resistance, especially at early stages of growth,

and earliness. The Texan type of male sterility has been successfully imparted to Glorija Janeckogo at Černovcy and Šulyndin; VIR 44 can be used for restoring fertility. Work on the development of double crosses more productive than Bukovina 3 is in progress at both places. The breeding material includes inbreds of Glorija Janeckogo.

3881 Galeev, G. S.
**(The method of producing interline hybrids with pollen-sterile maternal plants).**
Vestn. sel'skohozjajstv. Nauk (Rep. agric. Sci.) 1959 : No. 6 : 43–54. [Russian].
An extended account of the previous report on maize breeding at Krasnodar is given [cf. XXX, 1503].

3882 Boldorini, L.
Granoturco ibrido da foraggio. **(Hybrid maize for forage).**
Agric. bresciano 1960 : **7** : No. 16 : p. 2.
Figures are given showing that in the Italian province of Cremona yields of up to 1000 c. of green matter per ha. were obtained with the hybrid Mielmais [cf. XXIX, 3804–5], the sugar content being about 14%, compared with an average of 7% in other maize cultivars.

3883 Lonnquist, J. H.
**Modifying double-cross hybrid corn performance through convergent improvement.**
Agron. J. 1960 : **52** : 226–28.
Work on convergent improvement of inbred lines Wf9 and 38–11, the single cross of which is used as a seed parent in double-hybrid production in the central and southern areas of the Corn Belt, is described. The $F_1$ single cross was back crossed twice to each of the parent lines. Selfing and selection were subsequently practised within each of the back-cross progenies. After two generations of selfing, test crossing of selected segregates was initiated, by means of crosses to the recurrent and nonrecurrent parents and in top-cross tests. Selection during back crossing and selfing was based upon general appearance and the presence of desired traits at the time of pollination and harvest. One improvement sought was better pollen-shedding ability in Wf9. The $F_1$ of the finally selected recovered lines was equal in yield to the original $F_1$ single cross. In tests during 1957 and 1958, five double hybrids involving the recovered single-cross parent showed on the average superiority of 9% in yield over the corresponding double hybrids involving the original $F_1$ single cross.

3884 Bočev, B.
**(Irrigation of maize).**
Kooper. Zemed. (Cooper. Fmg.), Sofija 1959 : No. 4 : 20–22. [Bulgarian].
Varieties and hybrids recommended by the Varietal Commission for growing on irrigated land in different geographical regions of Bulgaria are listed. The material comprises mostly American or Soviet double crosses and intervarietal hybrids between local Bulgarian varieties such as Zlaten knoski zăb [Yellow dent] x Čirpan 96.

3885 Lascols, X.
Sélection réciproque et maïs hybrides précoces franco-américains. **(Reciprocal selection and early Franco-american maize hybrids).**
Ann. Inst. nat. Rech. agron., Paris : Sér. B 1959 : **9** : 377–401.

Lascols, X.
Récents hybrides de maïs. **(Recent maize hybrids).**
Agric. prat. 1960 : **124** : 64–66.
By crossing single-cross hybrids of American origin with single-cross European hybrids, a series of double-cross hybrids which combine the high productivity of American hybrids with the cold tolerance of European hybrids has been developed by the National Institute of Agronomic Research (INRA). INRA200 is described as a maize of limited vegetative development. At a density of 80,000 plants/ha. this hybrid yielded well, while on the highly fertile soils of Rennes and Versailles a maximum yield was obtained at 90–100,000 plants/ha. INRA244 is susceptible to lodging at maturity and is difficult to dehusk mechanically but is superior in yield to the Wisconsin hybrids W240 and W255. INRA258 is a highly productive hybrid which is also very resistant to lodging; considerable variation is found however in the size and shape of the ears. CIV7 is highly productive, especially in damp regions, is cold tolerant and highly resistant to lodging; grain size is very large however, and this hybrid is also susceptible to smut.

3886 **Plant breeding notes.**
Kenya Frmr. 1960 : No. 45 : p. 23.
Progress made in the maize programme initiated in 1956 at the Katumani Experimental Station, near Machakos, Kenya, to develop early-

maturing and thus drought-escaping synthetics for the dry areas is assessed.

3887 Malinowski, E., Bańkowska, H. & Biurkowska, M.
**Heterosis in maize (*Zea mays*). I. Correlation phenomena between vigorous growth and time of flowering in $F_2$. II. Fixing vigorous growth.**
Bull. Acad. polon. Sci. : Sér. Sci. Biol. 1960 : **8** : 23–27, 29–33.

The following crosses between inbreds were studied: Minn. A96 x Minn. MT42, Wis. 9 x Wis.D and MS209 x Minn. W9. The $F_1$ surpassed the taller parent in mean height in all three crosses and was earlier than the early parent in the last two, particularly in the very last; in the first cross flowering time was intermediate between the parental flowering times. In the $F_2$ generation of each cross a number of individuals taller than the tallest $F_1$ plants but flowering later were found. This vigorous growth proved heritable, and by selection and inbreeding in Wis.9 x Wis.D pure $F_3$, $F_4$ and $F_5$ lines more vigorous than the $F_1$ of the same cross grown in the same year were developed. The increase in vigour was accompanied by a delay in flowering.

3888 Pamfil, C.
Influența diferitelor agrofonduri de educare asupra producției unor hibrizi între soiuri de porumb și asupra formelor lor parentale. (**The influence of different agronomic conditions during training on the production of some intervarietal maize hybrids and on their parental forms**).
Probl. Agric., București 1959 : **11** : No. 10 : p. 104. (Abst.).

[Cf. 2630–1 and 2635].

3889 van Eijnatten, C. L. M.
**Report on a yield trial with varietal crosses.**
Mem. W. Afr. Maize Res. Unit, Ibadan 1960 : No. 19 : Pp. 10. (Mimeographed).

Forty-one varieties chosen from the collection of maize from Central America and the Caribbean Isles were crossed with three widely different tester varieties to evaluate their general combining ability for yield. EAFRO237 and EAFRO231 ranked highest, followed by Sicaragua, Br. 155 Trinidad and Br. 149 Trinidad. The interaction variety x tester was high.

3890 Jensen, S. D.
**Combining ability of unselected inbred lines of corn from incomplete diallel and top-cross tests.**
Diss. Abstr. 1959 : **20** : LC Card Mic 59–3386 : p. 839. (Abst.).

The 29 lines used were developed without selection during inbreeding of the open-pollinated variety Krug. Each line was crossed with eight of the remaining lines of the set so as to produce a total of 116 single crosses. Each line was also crossed with four widely used, high-yielding lines. Yield tests were conducted during 1957 at a centre in Iowa and another in Nebraska. Variances for general combining ability were greater than those for specific combining ability in the Iowa test, but the reverse was found for the Nebraska trial. In each locality, both general and specific combining ability were significant (1% level). In the analysis of the combined data, variance for general combining ability was nonsignificant while the specific combining ability mean square was greater than in the analyses for the localities separately. The top-cross test showed general combining ability to be greater than specific at each centre and in the combined analysis. The results were too inconsistent to make accurate estimates of the relative magnitudes of additive and nonadditive gene action. Correlation coefficients between estimated values for general combining ability based on the incomplete diallel series and on the top-cross tests were significant (1% level) in Iowa and nonsignificant in Nebraska and the combined analyses. Predicted single-cross yields based on top-cross performance were accurate in the Iowa test but inaccurate in the Nebraska test.

3891 Everett, H. L.
**Effect of cytoplasms and an Rf gene in maize.**
Agron. J. 1960 : **52** : 215–16.

Data were obtained on the yield and grain moisture content of the following: (1) the ordinary double hybrid Cornell M4 [(Oh.51A x Io.B8) x (Id.D50 x NY3)] in comparison with a seed mixture of Oh.51A (T cytoplasm for ♂ sterility) x Io.B8 and Id.D50 x NY3 or with the hybrid involving the ♂-sterile version of the single-cross parent, (2) NE310 [(Oh.51A x Io.B8) x NY16 (*Rf*)] and its isogenic counterpart involving Oh.51A (T), and (3) families segregating for sterility and fertility, derived from top crosses of 14 inbreds (*rf*) with NE310 (T) as ♀. Neither T cytoplasm nor *Rf* had any consistent effect on agronomic performance.

Significant differences found between *Rf* and *rf* counterparts in T cytoplasm in the top-cross families from two of the inbreds may have been due to specific genome-cytoplasm interaction, *Rf*-linked and *rf*-linked genes for heterosis or chance.

3892 Faludi, B., Dániel, Á. F. & Kelemen, G.
**Increased photosensitivity of leaf pigments and its relation to the respiratory system in albino mutants of corn.**
Physiol. Plant. 1960 : **13** : 227–36.

The albino maize mutants used in these experiments developed green leaves when grown in darkness. While normal and albino seedlings were identical with regard to their chlorophyll components they differed markedly in their carotenoid components. Carotenoid breakdown in illuminated albino seedlings was inhibited by the respiratory inhibitor diethyldithiocarbamate, which is specific for copper oxidases.

3893 Ashman, R. B.
**Stippled aleurone in maize.**
Genetics 1960 : **45** : 19–34.

A full account is given of investigations which have already been briefly reported [cf. 1516].

3894 Osler, R. D. & Palacios, G.
El valor de la selección visual entre mazorcas autofecundadas y las de polinización libre. **(The value of visual selection between selfed and open-pollinated ears).**
Agric. téc. Méx. 1959-1960 : No. 9 : 31–33.

The $S_1$ maize line Querétaro VI–366 (♀) was crossed with the open-pollinated varieties México 37 and México 38, the individual pollen plants being randomly chosen from the populations and classified, on the basis of plant and ear characters, as "selected" (good) or "non-selected" (not good). The selected and non-selected ♂ parents were also selfed. The progenies of the two varieties differed significantly in yield, ear characters, lodging and amount of ear rot, *Puccinia* and *Helminthosporium*; but between the progenies of the selected and non-selected parents within each variety there was in general no significant difference, either in the crossed or in the selfed progenies. It is concluded that the method of selection employed is of little value, probably because it was based on individual plants.

3895 Cosmin, O., Ulinici, V. & Păcuraru, I.
Valoarea biologică a soiurilor şi populaţiilor locale ca material iniţial pentru obţinerea liniilor consangvinizate şi a hibrizilor dubli de porumb. **(The biological value of varieties and local populations as initial material for obtaining inbred lines and double hybrids of maize).**
Probl. Agric., Bucureşti 1959 : **11** : No. 12 : 7–17.

Tests of local Rumanian populations at Fundulea and Săftica to ascertain their potentialities as sources of inbreds are reported. The principal useful characters of these populations are earliness, productivity and drought resistance.

3896 Cristea, M.
Studiul unor populaţii de porumb în condiţiile regiunii Suceava. **(A study of some maize populations under the conditions of the Suceava region).**
Stud. Cercet. şti., Biol. Şti. agric. Iaşi 1959 : **10** : 135–40.

Two local populations, Suceava 1 and 2, which have differentiated from Hîngănesc [maize from Hîngu], are described. They outyield Hîngănesc and are more resistant to *Ustilago zeae*.

3897 Frizen, E. E.
**(The maize Kičkasskaja).**
Kukuruza (Maize) 1959 : No. 6 : 25–26. [Russian].

Mention is made of the above local variety from the Orenburg province. It is early and ripens grain every year, the average yield being 40 c. per ha.

3898 Kurtz, E. B. (Jun.), Liverman, J. L. & Tucker, H.
**Some problems concerning fossil and modern corn pollen.**
Bull. Torrey bot. Cl. 1960 : **87** : 85–94.

A variety of maize was grown in 16 controlled environments representing different combinations of temperature, photoperiod and water supply. Measurements of acetolyzed pollen showed the long axis of the grain to be more changed by the environment than diameter of the pore (including the annulus). The ratio of (axis length$^2$)/pore diameter is therefore regarded as a better criterion than other measurements for distinguishing between relatively small effects of the environment on pollen size. Analysis of variance revealed the occurrence of variation in pollen size among plants grown in a given environment; genetic variability and microenvironments may thus have marked

effects. Environmental changes affecting axis length and pore diameter were of such magnitude that grains from different environments appeared to have been derived from more than one population. The results are discussed in relation to the problem of identifying fossil pollen as belonging to maize. In particular, it emerges that the use of the axis/pore ratio to differentiate between *Zea*, *Tripsacum* and *Euchlaena* is inadequate.

3899 Bianchi, A.
**(Mitosis in the tapetum of maize anthers).**
Caryologia 1959 : **12** : 338–40.

Very clear mitotic figures have been observed in the tapetum and are illustrated, with the suggestion that studies of this nature might contribute to an understanding of male sterility in maize.

3900 Nikitenko, G. F.
**(Some questions of breeding maize in districts new to its cultivation).**
Kukuruza (Maize) 1959 : No. 4 : 25–26. [Russian].

Intervarietal hybrids between early and late varieties were usually less productive than their parents in experiments conducted in the Mordva ASSR. It is recommended that the above method should be abandoned in favour of the production of inbred lines and testing these for combining ability. Forms with more than two ears on a plant are regarded as particularly valuable. Some lines having this characteristic are now available at the Mordva Research Station.

3901 Brodskaja, V. S.
**(Choosing the components and producing maize hybrids for Moscow province).**
Kukuruza (Maize) 1959 : No. 4 : 27–29. [Russian].

A series of hybrids productive of forage and grain at the milk-ripe stage were obtained from the crosses of early ♀ x late ♂ at the Forage Institute in experiments conducted in the province of Moscow and Poltava in the Ukraine. The early varieties Moskovskaja Skorospelaja [Moscow Early], Moscow 3, Moscow 5, Čakinskaja Žemčužina [Čakinskaja Pearl] and Voronež 76 were the best components when employed as ♀ parent, while Zakarpatskaja Želtaja Zubovidnaja [Transcarpathian Yellow Dent], Sterling and Osetinskaja Belaja Zubovidnaja [Osetian White Dent] proved the best late pollen parents. The $F_1$ from the crosses made at Poltava were taller and leafier than identical hybrids bred in Moscow province.

3902 Sokolov, B. P. & Gončar, I. D.
**(The method of hybridization by utilizing parental forms differing in earliness).**
Kukuruza (Maize) 1959 : No. 6 : 27–29. [Russian].

An account of crossing 49 early maize varieties and hybrids with the midseason single cross Slava [Glory], employing the last as ♂ parent, at Sinel'nikovo in Dnepropetrovsk province is given. The experiment was designed to study the method of production of high-yielding hybrids for the Nonchernozem zone. Among the material tested single crosses A34 x A171, A165 x WD and several others proved particularly valuable as components for crosses with Slava; they did not differ appreciably in growth period from Voronež 76 and Bezenčuk 41 but were more productive of grain when sown at the same time as Slava.

3903 Mayes, M.
**Factors affecting seed set with restricted pollination in corn *Zea mays*, L.**
Diss. Abstr. 1959 : **20** : LC Card Mic 59–3588 : 1120–21. (Abst.).

In an attempt to find the most efficient method of hand pollination for breeding purposes, the effects of the following upon seed set were investigated in sweet corn and maize: (1) tassel bagging *v.* no bagging in the collection of pollen, (2) different methods of silk cutting, (3) duration of silk receptivity, (4) pollinations made at different times of day, (5) temperature and relative humidity and (6) soil-moisture deficiency. Appreciable effects were noted only for (2) and (3).

3904 Hadžinov, M. I.
**(The method of breeding sterile hybrids).**
Kukuruza (Maize) 1959 : No. 4 : 19–23. [Russian].

At Krasnodar, lines with the Moldavian and Texan types of sterility and lines restoring the fertility of one or the other of these types have been developed. A line restoring fertility to material with either kind of sterility was produced from the variety Meksikanskaja Ijun'skaja [Mexican June]. Among the material whose fertility can be fully restored are the new hybrids Kuban' 1s, Kuban' 2s and Kuban' 3s. Work on imparting sterility to Gloria Janeckogo [Janeckij's Glory], Sterling and Voronež 76 is reported, the aim being to utilize their sterile

analogues for development of synthetic hybrid populations. The sterile form of Voronež 76 is also being used for breeding male-sterile top crosses.

3905 Feofilatova, T. N.
**(At the Stalino agricultural station).**
Kukuruza (Maize) 1959 : No. 5 : 21–22. [Russian].

This report on maize breeding mentions seed production, the testing of maize inbred lines from the Institute of Plant Industry, the breeding of high-yielding top crosses and the selection of male-sterile forms of Gruševka x Spasovo. These last are characterized by improved drought resistance and greater earliness by comparison with the male-sterile forms derived from Moldavian material and efforts are made to transfer their male sterility to drought-resistant midseason hybrids. Several high-yielding top crosses were bred. They include Donec 1 [(40 x 44) x Gruševka 380] which yields 2–2·5 c. more grain than VIR 42 [Institute of Plant Industry 42] and the early hybrids [(40 x 44) x Voronež 76] and [(40 x 43) x Voronež 76]. The most productive forage types among the new top crosses were obtained from (40 x 44) x North Dakota and (40 x 42) x North Dakota. Their green-matter yields were 32·1 c. and 37·3 c. higher than that of VIR 42.

3906 Kuperman, F. M., Mar'jahina, I. Ja. & Bajsugurova, A. I.
**(The diagnosis of male sterility in maize).**
Kukuruza (Maize) 1959 : No. 5 : 16–18. [Russian].

Cytological analyses of the sterile analogue of the normally fertile single-cross Slava [Glory] showed that degeneration set in at the later stages of pollen development. However, morphological differences and differences in growth and development between the fertile and pollen-sterile forms were observed at earlier stages. The sterile forms had much shorter internodes from the ninth internode upwards and they eared earlier and developed tassels later. It is thought that measurement of the length of the internode immediately below the tassel can be utilized in separating pollen-sterile plants from normally fertile plants of the same variety or hybrid.

3907 Zuber, M. S. *et al.*
**Some observed secondary effects of high-amylose genes in maize.**
Cereal Chem. 1960 : **37** : 212–17.

The possibility of developing hybrids with high amylose content but a relatively low protein content in the endosperm merits attention since considerable difficulty is encountered in the separation of gluten and starch in wet-milling maize containing more than 50% amylose. The data reported suggest that the protein content of the endosperm may be expected to be higher and the kernel weight lower in high-amylose maize, regardless of whether *ae* ($ha_1$), *du* ($ha_2$) or the double recessive combination of these genes is present in a given genotype. The gene *du* has however a less pronounced effect on the relationship between protein and amylose contents than *ae*. It would therefore be more difficult to select a high-amylose strain with low protein content from inbreds converted to *ae*. Addition of *du* to *ae* conversions would raise the likelihood of selecting such a strain. Preliminary observations have suggested that under adverse growing conditions amylose content decreases and protein content of the endosperm increases. The genetic environmental interaction should therefore be taken into consideration in breeding for the type of maize in question. Possibly *ae* and *du* in other genetic backgrounds might give different results from those reported.

3908 Galinat, W. C.
**The phytomer in relation to floral homologies in the American Maydeae.**
Bot. Mus. Leafl. Harv. 1959 : **19** : 1–32.

An attempt is made to trace the various types of expression of the phytomer, which is regarded as the fundamental unit of organization in plants of maize and its allies, in different parts of the plant. In the vegetative parts it consists of node, associated leaf, axillary bud and prophyll and adjacent internode. The leaf subtending the tassel is usually reduced and the leaves which potentially subtend the spikelets are normally reduced to glume cushions. Axillary buds in different parts of the plant form tillers, ear shoots, tassel branches, spikelets and florets. The prophyll, normally occurring at or near the axil of a lateral bud, appears to correspond to the palea in the ♂ florets, the pulvinus in the tassel branches, the rachid scab at the base of the spikelet and the cupule lining in the ♀ flowers. The interpretation offered is supported by observations on the histology of the various rudimentary organs and by the clear homologies shown by the various organs when they undergo abnormal development in the presence of certain genes. Vascular traces associated with the glume cushion, pulvinus and cupule appear to be part of the rind of the rachis and cannot therefore be used to elucidate the homologies.

3909 Stafijčuk, A. A.
**(The question of determining the quality of protein in maize).**
Dokl. Vsesojuzn. Akad. sel'skohozjajstv. Nauk Lenin. (Proc. All-Un. Lenin Acad. agric. Sci.) 1959 : No. 6 : 7–9. [Russian].
Biochemical studies at the All-Union Maize Institute suggest that the quality of protein can be evaluated by the non-zein protein and tryptophane contents of the dry grain.

3910 Bauman, L. F.
**Relative yields of first (apical) and second ears of semi-prolific southern corn hybrids.**
Agron. J. 1960 : **52** : 220–22.
Analysis of first and second-ear yields of ten double-cross hybrids at three centres in Georgia indicated that (1) the hybrids differed more in second-ear yields than in either first-ear or total yield, (2) variations in second-ear yield accounted for most of the differences in yield within hybrids according to locality, (3) hybrids with high second-ear yields tended to bear smaller first ears and (4) the shelling percentages of first and second ears were almost equal.

3911 Sidorov, F. F. & Zubkova, S. V.
**(Cold resistance of maize).**
Vestn. sel'skohozjajstv. Nauk (Rep. agric. Sci.) 1959 : No. 6 : 55–60. [Russian].
The capacity of the seed to germinate and of the young plants to initiate growth at low temperatures was used to determine cold resistance of 200 varieties and hybrids at the Institute of Plant Industry. Varieties and hybrids distinguished by cold resistance are listed, the hardiest coming from Holland, Germany and the mountainous regions of various countries. Others included Georgian and US material and some forms introduced from countries with a warm climate. For practical breeding work the following test is recommended. Germinating seed should be kept in a thermostat at 3–5° C. for 14 days and then sown in the open ground; cold-resistant plants should have the same field viability as the plants of the same variety raised from seed soaked at room temperature 24 hr. before sowing.

3912 Hulea, A.
Uscarea plantelor de porumb cauzată de *Fusarium* sp. **(Maize wilt caused by *Fusarium* sp.).**
Probl. Agric., Bucureşti 1959 : **11** : No. 9 : **31–37.**
American and Rumanian hybrids and varieties resistant to *Fusarium* wilt in Rumania are cited. The principal pathogens are *F. moniliforme* (*Gibberella fujikuroi*) and *F. graminearum* (*G. zeae*).

3913 Knox-Davies, P. S.
**The cytology and genetics of *Helminthosporium turcicum* and its ascigerous stage, *Trichometasphaeria turcica*.**
Diss. Abstr. 1959 : **20** : LC Card Mic 59–3268 : p. 861. (Abst.).

Knox-Davies, P. S. & Dickson, J. G.
**Cytology of *Helminthosporium turcicum* and its ascigerous stage, *Trichometasphaeria turcica*.**
Amer. J. Bot. 1960 : **47** : 328–39.
Investigations on the above were undertaken to determine ways in which variations in cultural characters and pathogenicity may arise. The results included the finding that aneuploidy occurs in *T. turcica*, as indicated by sectoring of single-ascospore cultures, chromosome counts and irregularities in the appearance and behaviour of nuclei and chromosomes in the asci.

3914 Candia Z., D. & Barnes, D.
Infestación del maíz en el campo por *Sitophilus oryzae* (L.). [**Field infestation of maize by *Sitophilus oryzae* (L.)**].
Agric. téc. Méx. 1959–1960 : No. 9 : 9–10.
The amounts of damage and infestation after storage for 28 days immediately after harvesting were greater in three hybrid varieties than in three local Mexican maizes. The thicker, more closely appressed and more numerous spathes of the local varieties and the greater length of spathe extending beyond the tip of the ear appear to hinder infestation and oviposition on the grains. The possibility that the grains of the local varieties may themselves be less attractive to the insects is not excluded.

3915 Portjanko, V. F.
**(The response of maize to short days depending on plant age and spectral composition of light).**
Fiz. Rasten. (Phys. Pl.) 1959 : **6** : 622–24. [Russian].
The effects of a 10 hr. photoperiod upon the growth and development of varieties with different vegetative periods were studied at Berdjansk in the Ukraine. The response of a variety to short days depended on the age of the plant; early varieties responded immediately after emerging while midseason and late varieties responded 6–12 days after emerging. Subjecting early varieties to 10 hr. days for 1–3 days

gave the earliest development of the tassels. The optimum duration of treatment for the midseason types was 6–9 days and for the late types 10–20 days. All varieties passed through the light phase and developed normally when subjected to full spectral light from 7 to 17 hr., but the late and midseason varieties were checked in their development at the 5th–8th leaf stage when the plants were screened from light from 9 to 14.30 hr.

## BARLEY

3916 Wagner, S. & Buchli, M.
Aus der Arbeit des Internationalen Braugersten-Komitees. **(From the work of the International Malting Barley Committee).**
Mitt. schweiz. Landw. 1960 : **8** : 1–3.

The varietal testing carried out by this committee is described and the relative yields obtained from nine varieties tested in 13 countries in 1959 are reported. The varieties Union and Volla gave the best average yields.

3917 Gill, W. D., Holmes, J. C. & Rodger, J. B. A.
**Spring barley variety trials, 1956-58.**
Scot. Agric. 1960 : **39** : 208–13.

Information is given on the agronomic, brewing and milling performance of varieties tested in south-east Scotland, with Ymer as control.

3918 Bjaanes, M.
Forsøk med byggsorter. **(Trials of barley varieties).**
Forskn. Fors. Landbr. 1960 : **11** : 97–147.

Data on two-rowed and six-rowed barleys tested in Norway for varying lengths of time during the period 1938–58 are presented. On the basis of the trial results, recommendations are made regarding the best varieties for different regions.

3919 Pop, O., Manu, S., Siminel, M., Botezan, V. & Munteanu, I.
Cultura orzului de toamnă și a orzului de primăvară în regiunea Cluj. **(The cultivation of winter barleys and spring barleys in the Cluj region).**
Probl. Agric., București 1959 : **11** : No. 9 : 19–30.

Variety trials at Cluj and Cîmpia Turzii are reported, data being provided on yield, 1000-grain and hectolitre weights and resistance to diseases and lodging. The most productive barley was the winter variety Cenad 396.

3920 Garcia S., A. & Navarro F., M.
Progreso en el mejoramiento de la cebada en México. **(Progress in barley breeding in Mexico).**
Agric. téc. Méx. 1959–1960 : No. 9 : 46–48.

In preliminary studies of maturity period, disease resistance, height and number of grain rows in more than 5000 introduced and native varieties, some 200 remained free from stem rust during a severe epiphytotic in Chapingo and a number of varieties proved resistant to *Helminthosporium* spp. and *Rhynchosporium secalis* at Santa Elena. As a result of further trials of selected lines, a variety with good malting quality is being distributed under the name Toluca I. It has a tendency to break at the base of the rachis, but this defect is less apparent if sowing is carried out in the dry season. The Canadian varieties Vantage and Winnipeg may be sown in both the rainy and dry seasons. Crossing of varieties to produce a good malting barley is also under way.

**Report of the Barley Improvement Conference held at Hotel Schroeder, Milwaukee, Wisconsin, January 20, 1959** : Pp. 67. (Mimeographed).

3921 *Sisler, W. W. Support of and progress in developing superior varieties of malting barley.* (*pp. 2–10*).

Feebar, which is resistant to *Septoria passerinii*, was crossed with Kindred and Montcalm. Thirty-seven selections from their progeny are now being tested for malting quality.
Forty selections from Traill x Feebar are being crossed with varieties of good malting quality. A *Septoria*-resistant selection B112 has also been crossed with Traill, and from their progeny 120 resistant selections, many of them also with some resistance to *Cochliobolus sativus*, are now being tested for malting quality. Selections showing moderate resistance to *C. sativus* have been developed at Minnesota by crossing the moderately resistant Iowa 5286 with UM570 and Forrest.

3922 *Schaller, C. W. Malting barley research program in California.* (*pp. 10–14*).

Attempts are being made to develop non-shattering strains of Kindred, Traill and Montcalm. A project to produce a six-rowed strain of Hannchen is progressing satisfactorily.

3923 *Shands, R. G. Summary of yields and agronomic characters of barley varieties in the Midwest.* (*pp. 23–26*).

Tabulated information on yield, test weight,

heading date, height and lodging percentage is given.

3924 *Dickson, A. D. Report of experimental malting tests on barley varieties grown in 1957 and 1958.* (*pp. 27–38*).
In trials of two-rowed varieties, Firlbeck's III, which yielded well, showed the best balance of quality factors.
With the aim of increasing kernel size, Traill and sister selections were crossed with other varieties. Selections from these crosses showed an improvement in kernel weight and size, and were satisfactory in malt extract.

3925 *Lejeune, A. J. Surveys of barley varieties grown in midwestern and western states and acceptable varieties of malting barley for planting in 1959.* (*pp. 56–61*).
A list of varieties which when grown in the states recommended are acceptable for malting and brewing purposes by the Malting Barley Improvement Association is appended.

3926 Piccioni, M. & De Marco, G.
Prospettive di una nuova coltivazione: orzo distico primaverile. (**Prospects of a new crop: two-rowed spring barley**).
Sementi elette 1960 : **6** : No. 2 : 29–36.
A report is given on the barleys tested in Italy for the European Brewery Convention during the years 1955–59. The results showed that two-rowed malting barleys when grown in Italy gave grain of top quality and their yield was higher than that from either six-rowed barleys or wheat, especially on the poorer soils.

3927 **World catalogue of genetic stocks. Barley.**
FAO UN, Rome 1959 : Pp. 14.
The FAO project on the world catalogue of genetic stocks has been extended to barley, in addition to wheat and rice. Information is given on characters of stocks maintained in 11 European countries.

3928 Murty, G. S. & Jain, K. B. L.
**Genetic studies in barley. I. Inheritance of pigmentation in various plant parts.**
J. Indian bot. Soc. 1960 : **38** : 561–74.
The genetics of pigmentation was studied at the Indian Agricultural Research Institute, New Delhi, in crosses involving foreign types. Normal green coloration was dominant over virescence and monogenic. Anthocyanin pigmentation in the leaf sheath and node was dominant over its absence and determined by a single gene or very closely linked genes. Minor genes may affect the intensity of anthocyanin pigmentation of the leaf sheath. In the one cross analysed for auricle colour, purple was dominant over white and monogenic. Black pigmentation of the lemma, pericarp, outer glumes and awns was dominant over its absence and under the control of a single gene or very closely linked genes.

3929 Davies, D. R.
**The embryo culture of interspecific hybrids of *Hordeum*.**
New Phytol. 1960 : **59** : 9–14.
Rappaport's modification of the nutrient solution described by Randolph and Cox was used as a culture medium for excised embryos of *H. californicum* (2*x*) x *H. vulgare* (2*x*), *H. vulgare* (2*x*) x *H. bulbosum* (4*x*), *H. vulgare* (4*x*) x *H. bulbosum* (4*x*), *H. californicum* (2*x*) x *H. bulbosum* (4*x*), *H. californicum* (2*x*) x *H. bulbosum* (2*x*), *H. vulgare* (2*x*) x *H. bulbosum* (2*x*) and *H. californicum* selfed. All the hybrids showed some growth and the chief difficulties appeared to be technical rather than due to any inherent incompatibility between genotypes. Failure of growth occurred when the embryos were not detached from the endosperm. Vigorous mature plants which survived transplanting and flowered were obtained only in *H. vulgare* (2*x*) x *H. bulbosum* (4*x*). The hybrids were morphologically more like the wild than the cultivated species, but showed some variation in height, bulb formation and pubescence and were intermediate in awn length and anther size. Meiosis was normal in the diploid parent and regular but with many quadrivalents in the tetraploid. The hybrids had varying numbers of univalents, bivalents, trivalents and occasionally quadrivalents. The percentage of good pollen was 0·35–15·9% and no grains were produced in selfing or back crossing.

3930 Mota, M. E. G. de M.
Uma variedade nova de cevada obtida pela acção dos raios-X. (**A new variety of barley obtained by the action of X rays**).
Agricultura, Lisboa 1959 : No. 4 : 33–34.
A reference is made to the variety Pallas [cf. XXIX, 3526] and other artificial mutants produced in Sweden.

3931 FERRARY, R.
Induction de mutations chez l'orge cultivée sous l'effet des radiations ionisantes. (**The induction of mutations in cultivated barley by means of ionizing radiation**).
Ann. Inst. nat. Rech. agron., Paris : Sér. B 1959 : **9** : 403–20.

Grains of the spring-barley varieties Rika and Piroline were subjected to treatment with X and $\gamma$ rays and thermal neutrons, and the resulting mutants are described and classified. Six of the mutants are considered sufficiently promising to merit inclusion in a breeding programme; the characters they exhibit are: erect head, reduced awns, slender glumes, short, stiff straw and large grain.

3932 KAMRA, O. P., KAMRA, S. K., NILAN, R. A. & KONZAK, C. F.
**Radiation response of soaked barley seeds. I. Substances lost by leaching. II. Relation of radiobiological damage to substances lost by leaching.**
Hereditas, Lund 1960 : **46** : 152–70, 261–73.

Distilled water in which the seeds had been soaked contained many ninhydrin-positive compounds and many inorganic constituents. Loss of aminoacids and other ninhydrin-positive substances could be detected within 15 minutes of soaking and was greater when nitrogen, instead of oxygen, was bubbled through the water. Most of the ninhydrin-positive substances leached out within 6 hours of soaking. The concentration of inorganic compounds increased with time of soaking, reaching a maximum at the end of 20 hours; with further soaking reabsorption occurred. Analysis of continuous and fractionated leached extracts indicated that the ninhydrin-positive substances were free in the seeds and not the result of protein degradation. The seedcoat (pericarp + testa) was differentially permeable, as shown by qualitative and quantitative comparison of the leached extracts of intact seeds and of isolated embryos and endosperms. According to the results of soaking seeds in glucose and KCl solutions, the amounts of ninhydrin-positive substances increased with osmotic concentration. Presoaking treatment consisting of (1) X irradiation and storage or (2) storage under oxygen or nitrogen pressure had no quantitative or qualitative influence upon the organic substances lost, but the amounts of iron and aluminium increased as the result of the seed damage due to either treatment. Damage due to X irradiation was determined by measuring (1) damage to the seedlings ($X_1$) raised from the treated seeds, as indicated by data on height, (2) frequency of chromosome aberrations in shoot tips of $X_1$ seedlings and (3) frequency of seedling chlorophyll mutants in the $X_2$. After soaking, the seeds were dried to 15% moisture content so that they were essentially resting when irradiated. With increasing time of soaking, damage as shown by (1), (2) and (3) increased. Seeds soaked for 20 hr. were usually most susceptible to X rays; additional soaking led to some reduction in (1). As little as 3 hr. soaking changed (2) but not (1). Damage also increased with the presence of oxygen, as well as with higher temperature, during soaking. Possibly the greater effect of oxygen was related to the greater meristematic activity of seeds soaked in its presence. Soaking by itself did not cause breakage but increased stickiness, possibly as the result of alteration in the chemical environment of the cells, due in turn to loss of many energy-rich compounds during soaking. A significantly higher frequency of mutation was found for nonirradiated but soaked seeds than for nonsoaked seeds. It was concluded that the increased sensitivity of the soaked seeds to X rays is in general not entirely due to the indirect effects of water but may be in part related to the nature and amounts of the substances leached out.

3933 RAMAGE, R. T. & DAY, A. D.
**A 10 : 3 : 3 ratio for leaf width in barley.**
Agron. J. 1960 : **52** : p. 241.

One of two single recessive mutants induced in Hannchen by irradiation bore narrower leaves (*nlh*) than normal and the other wider leaves (*wlh*). A ratio of 10 normal : 3 narrow : 3 wide-leaved plants was obtained in the $F_2$ of the cross between the two mutants. This ratio is explained on the assumption that the double recessive *nlhnlh wlhwlh* and double dominant *NlhNlh WlhWlh* both have the normal phenotype. The $F_3$ breeding behaviour of the three $F_2$ phenotypes conformed with this interpretation.

3934 HÖRBERG, Y.
Die Sommergerstensorten Rika und Ingrid. (**The summer barley varieties Rika and Ingrid**).
Agri hort. genet., Landskrona 1960 : **18** : 97–108.

Details of the yield, lodging resistance and

quality of Rika [XXII, 1907 and XXV, 1974] and Ingrid [XXVIII, 485] are given.

3935 Barnes, B. S.
**Two new winter barley strains for Mississippi.**
Miss. Fm. Res. 1960 : **23** : No. 5 : 1, 2.

Each developed at the Mississippi Agricultural Experiment Station from a multiple cross, the early to midseason six-rowed barleys Pace and Oma are both resistant to net blotch, leaf rust and soil-borne mosaic and tolerant of scald. Pace is also resistant to powdery mildew, stem rust and bacterial blight, and Oma to lodging.

3936 Rajhathy, T. & Morrison, J. W.
**Cytogenetic studies in the genus *Hordeum*. IV. Hybrids of *H. jubatum*, *H. brachyantherum*, *H. vulgare*, and a hexaploid *Hordeum* sp.**
Canad. J. Genet. Cyt. 1959 : **1** : 124–32.

To investigate relationships in the above species the following crosses were effected: *H. jubatum* x *H. brachyantherum*; *H. jubatum* x *H. vulgare*; *H. brachyantherum* x *H. vulgare*; (*H. jubatum* x *H. brachyantherum*) x *H. vulgare*; and (*H. jubatum* x *H. brachyantherum*) x a hexaploid species, probably *H. arizonicum*.

On the basis of cross compatibility, hybrid fertility, and chromosome morphology and pairing, it is concluded that (1) *H. jubatum* and *H. brachyantherum* are very closely related and belong to the same Mendelian population; (2) no homology exists between the genomes of *H. vulgare* and those of the wild species *H. jubatum* and *H. brachyantherum*, and there is no close relationship; and (3) two genomes of the hexaploid *Hordeum* species studied are homologous with genomes of *H. jubatum* and *H. brachyantherum*. [Cf. 1546].

3937 Holm, G.
**An inversion in barley.**
Hereditas, Lund 1960 : **46** : 274–78.

Cytogenetical analysis showed that an inversion detected in X-irradiated Ymer was associated with (1) a factor for microspore necrosis, (2) a recessive sublethal *xantha* gene or (3) a factor for male sterility characterized by partial transformation of the anthers into ovaries.

3938 Ramage, R. T.
**Trisomics from interchange heterozygotes in barley.**
Agron. J. 1960 : **52** : 156–59.

Morphological descriptions are given of trisomics obtained from the progenies of plants heterozygous for a chromosomal interchange. These interchange plants were all derived from the variety Mars.

Trisomic plants from the different interchanges differed considerably in their morphological characteristics. Also, trisomics from the same interchange differed in such characters as height, time of maturity, tiller number, vigour, and degree of ovule fertility. Nevertheless certain of the trisomics could be easily and accurately identified by their phenotypes.

3939 Smith, W. E.
**Fertility of autotetraploid varieties and hybrids of barley.**
Canad. J. Pl. Sci. 1960 : **40** : 434–42.

The main results of this study, conducted during 1952–58 at the University of Alberta, have already been briefly reported [cf. 24].

3940 Kivi, L. E.
Ohralajkkeitten tähkäidäntäherkkyyden erot "katosivat". (**Differences in "crop failure" in the tendency of barley varieties to sprout in the ear).**
Koetoiminta ja Käytäntö 1959 : **16** : p. 39.

Experiments have been conducted in Finland to compare Svalöv 50/102 and Carlsberg II with Balder with respect to germination in the ear, by placing the ears, when yellow, in damp sand. In 1959, when growth was more rapid than in other years, Carlsberg II was slower to sprout under these conditions than Svalöv 50/102, while in other years, when sprouting was less marked, the difference was less pronounced. Balder in 1959 gave a higher percentage of sprouting than Carlsberg II, but was below that shown by Svalöv 50/102.

3941 Ključareva, M. V.
**(The nature of the process of fertilization in the light of new facts on the development of the chromosomes in the zygote).**
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1960 : **131** : 1161–64. [Russian].

Cytological studies of the development of the fertilized egg cells of barley and rye at the Institute of Genetics of the USSR Academy of Sciences are described. Little new emerges from these experiments, which support the author's previous findings [cf. 1552].

3942 Nečas, J.
**The heritability of the amylolytic activity in barley.**
Biol. Plant., Praha 1960 : **2** : 1–18.

Of the five varieties tested, the six-rowed form

*Hordeum vulgare* var. *brachyurum* showed the greatest β-amylase activity per unit of dry weight and the two-rowed varieties Stupický Full Grain and Dětenický Hero had considerably lower activities; one four-rowed type had an activity approaching that of the six-rowed form and another four-rowed type had the lowest value. Environmental factors were found to have considerable influence on β-amylase activity. Variety also played an important part in determining total variability. The most important interactive component of variability was the interaction of variety x year indicating that reaction to changing climatic conditions is a varietal character. Varieties also seemed to have a specific reaction to soil conditions. The β-amylase activity was evaluated for $F_1$ plants of crosses between these five varieties. The values for reciprocal crosses were in most cases significantly different, the maternal parent having the greatest influence on β-amylase activity.

When the values for β-amylase activity were calculated relative to dry weight of grain without glumes, varietal differences were emphasized but the order of varieties was not changed. When average activity was calculated relative to 1000-grain weight, the order of varieties was markedly changed. There was a significant intervarietal negative correlation between 1000-grain weight and average β-amylase activity. By using activity values relative to 1000-grain weight, selection for two important characters can proceed simultaneously.

The α-amylase activity was also found to be a varietal character and the varietal component in the total variability of this character was significant and greater than that due to external factors. There seemed to be a positive correlation of the activities of both amylases in the two-rowed varieties and in *H. vulgare* var. *brachyurum*. The four-rowed variety with the lowest β-amylase activity in ungerminated grain achieved the highest α-amylase activity during germination and the other four-rowed variety showed the slowest development of α-amylase activity.

3943 Strel'čenko, T. I.
**(The floral biology of winter barley).**
Agrobiologija (Agrobiology) 1959 : No. 3 : 458–60. [Russian].

Minor varietal differences in the degree of opening of the flowers in six local varieties studied at Černovcy are described. The percentages of open flowers for all varieties were high enough for half the flowers to be cross pollinated. References are made to the probable effects of flower opening and lodicule shape upon varietal resistance to loose smut.

3944 Columbus, A., Harnisch, W. & Scholz, F.
Verdaulichkeits-, N-Bilanz- und Fütterungsversuche mit einer nacktkörnigen Gerstenmutante und ihrer bespelzten Ausgangssorte an wachsenden Labortieren und Schweinen. (**Digestibility, nitrogen balance and feeding experiments with a naked-grained barley mutant and its glumed initial variety on growing laboratory animals and pigs**).
Arch. Tierernähr. 1959 : **9** : 140–65.

The naked mutant is very similar in important characters to the original variety Haisa, which it equals in yield of husked grain. Tests on pigs showed that the percentage of digestible protein in the dry matter is 11·9% in the mutant and 9·5% in the normal form, the corresponding values for total nutrients being 93·4 and 85·7. The percentage of physiologically usable protein was 6·1 in the mutant and 5·5 in Haisa. Pigs showed the same weight increase after eating 90 kg. of the mutant as they did with 100 kg. of the normal variety. It is concluded that the naked barley is particularly valuable for feeding poultry and pigs.

3945 Johnson, L. P. V. & Aksel, R.
**Inheritance of yielding capacity in a fifteen-parent diallel cross of barley.**
Canad. J. Genet. Cyt. 1959 : **1** : 208–65.

Studies of the three yield components, number of heads per plant, number of kernels per head and 100-kernel weight, in the first three hybrid generations from a 15-parent diallel cross involving 105 interparental crosses are described. An analysis of the $F_1$ and $F_2$ has already been briefly reported from another source [cf. XXIX, 1016].

The inheritance of yield and its three components was studied in the $F_3$ on the basis of three diallels: the complete 15-parent, the 10-parent (exclusively six-rowed parents) and the 5-parent (exclusively two-rowed) diallels. The 15- and 5-parent diallels showed associations between high expressions of yield and each of its components on the one hand, and an excess of recessive genes on the other. The 10-parent diallel showed significant association between high expression and an excess of recessive genes for kernel weight but with an excess of dominant genes for yield. No significant correlation was

found in the case of number of heads per plant or number of kernels per head; this is attributed to changed interaction between six-rowed genotypes where dominant genes possessed by two-rowed parents were removed.
Number of kernels per head was shown in both the $F_2$ and $F_3$ to be predominant in determining yield. It is suggested that the general similarity of inheritance for all three yield components, viz. high expression of each character associated with an excess of recessive genes, may represent different physiologically-controlled expressions of the same genes.

3946 Lee, J. A.
**A study of plant competition in relation to development.**
Evolution, NY 1960 : **14** : 18–28.
The barleys Atlas 46 and Vaughn were grown in pure stands and mixtures with a plant spacing of 4 in. during winter 1956–57 and summer 1957 at North Carolina State College. Bulk plantings of the two varieties in pure stands and mixtures were also made in both seasons. Data were recorded on dry plant weight and tiller number at intervals during development and on seed yield. No measurable effect due to competition could be detected until both varieties in winter and Atlas 46 in summer had reached the jointing stage. After the onset of competition Vaughn showed sudden, large reductions in tiller production and slower rate of growth in mixtures than pure stands. In both seasons, the ultimate result of competition was curtailment of grain yield in Vaughn and a corresponding superiority in the productivity of Atlas 46. A study of root systems revealed that Atlas began to proliferate a dense mass of roots from the crown at about the time at which the internodes began to lengthen. Such root development in Vaughn was not noted. At this stage Atlas 46 may thus become more efficient in obtaining nutrients from a fairly limited area of soil. The results suggest that the role of intraspecific competition in natural selection may in general be a negative one, although such competition may be important in moulding the gene pool in the direction of conditioning greater adaptability.

3947 Favret, E. A.
**Spontaneous and induced mutations of barley for the reaction to mildew.**
Hereditas, Lund 1960 : **46** : 20–28.
Using varieties carrying dominant genes for resistance or recessive genes for susceptibility, the rate of mutation (m) affecting reaction to mildew (*Erysiphe graminis*) was determined at the Institute of Plant Technology, Castelar, Argentina. Rate of chlorophyll mutation (c) was also determined, ratios between the two frequencies (m : c) being employed as a criterion of mutagenic activity. Mutation from susceptibility to resistance was induced by $\gamma$-ray, fast-neutron or formaldehyde treatment. None was obtained in the control material or as the result of ethylene oxide treatment. Plotted against dose, frequency of mutation for resistance showed an exponential increase, whereas frequency of chlorophyll mutation increased linearly. As indicated by the m : c ratio (0·1) for the susceptible variety Maltería Heda, neutrons and $\gamma$ rays were equally effective. Mutation from resistance to susceptibility occurred spontaneously. With ethyl oxide and $\gamma$-ray treatments, a nonsignificant increase in the frequency of such mutation occurred. Mutation to resistance is concluded to be the outcome of chromosome breakage. Mutation to susceptibility, possibly occurring only spontaneously, may have been the consequence of less drastic chromosomal changes. The mutagens showed different mutation spectra with respect to mildew reaction and chlorophyll variants.

3948 Wiberg, A.
**Physiological races of *Erysiphe graminis* DC f. sp. *hordei* Marchal in Sweden.**
Phytopath. Z. 1960 : **38** : 153–60.
Twelve physiological races were identified in 67 single-pustule cultures obtained from conidia collected in southern and south-eastern Sweden in 1958. Ten of these races have previously been reported in Germany; the new ones are $A_6$ and $A_4$. Another race $B_7$ was isolated from ascospores but was not found among the cultures obtained from conidia.

3949 Malik, M. M. S. & Batts, C. C. V.
**The determination of the reaction of barley varieties to loose smut.**
Ann. appl. Biol. 1960 : **48** : 39–50.
A technique involving dropping coloured water on to the ears for the estimation of field reaction of barley varieties to *Ustilago nuda* was tested on a series of varieties of known reaction. The method determines whether or not the spikelets of a given variety open for pollination and indicates directly the number of spikelets which open. Ratings for field susceptibility based on this method were in complete agreement with

the known behaviour of the varieties in the field.

## MILLETS AND SORGHUMS

3950 Liang, P.-Y., Lee [Li], Y.-L. & Shen, L.-M.
**(Studies on *Piricularia setariae* Nishikado).**
Chih-wu Ping-li-hsueh Pao (J. Pl. Path.)/ Acta phytopath. sin. 1959 : **5** : 89–99. [Chinese].

Data are provided on the resistance of *Setaria* varieties in the province of Shantung to the above pathogen. Some varieties are more susceptible at the seedling stage than at heading, in others the converse holds, some varieties are susceptible throughout the life cycle, while others, such as 332* and Chiu-hsien-tzu, are comparatively resistant at all stages.

3951 Ratnaswamy, M. C.
**Cytoplasmic inheritance of variegation in bajara, the pearl millet (*Pennisetum typhoides* Stapf and Hubbard).**
Madras agric. J. 1960 : **47** : 109–17.

Albinism depended on a single recessive gene and was transmitted only through the mother plants.

3952 Pantulu, J. V.
**Accessory chromosomes in *Pennisetum typhoides*.**
Curr. Sci. 1960 : **29** : 28–29.

Three accessory chromosomes were observed in the pollen mother cells of *P. typhoides* 'Dochan' a variety of Sudanese origin. The significance of accessory chromosomes in determining centres of origin is discussed.

3953 Aziz, M. A., Manzoor Ahmad Bajwa & Siraj-ud-Din Shah
**Pollen viability and stigma receptivity in pearl millet (*Pennisetum typhoideum* Rich).**
Agriculture, Pakistan 1959 : **10** : No. 4 : 457–62.

At the Cereal Breeding Station, Lyallpur, W. Pakistan, pollen of pearl millet retained viability up to 7 hr. after anther dehiscence but was most effective up to 5 hr. The stigmas remained receptive up to 48 hr. after extrusion, receptivity being at a maximum at the age of 12–18 hr. Under cloudy conditions, receptivity was prolonged up to 6 days.

3954 Subramanian, A. & Sivagnanam, L.
**Ragi PLR-1 outyields other improved strains in June planting.**
Madras agric. J. 1960 : **47** : p. 76.

*Eleusine coracana* 'PLR1', a high-yielding selection from the local type Perum ragi, has been found suitable for the main and summer crops in the Chingleput and South Arcot districts, Madras. It requires 110 days after sowing to reach maturity.

3955 Divakaran, K.
**Inheritance of toppling in *Eleusine coracana* (Gaertn).**
Madras agric. J. 1960 : **47** : 74–75.

The term toppling is applied to a kind of lodging which occurs in the reniform-grained type of *E. coracana* and is characterized by an indiscriminate falling of the culms in all directions irrespective of weather and soil-fertility conditions. According to data from EC4608 (toppling) x Co. 1, toppling depends upon double recessiveness for duplicate factors.

3956 Pietro, B.
Erbaio di sorgo da foraggio. **(Herbage of forage sorghum).**
Agric. bresciano 1960 : **7** : p. 2.

Tests of hybrid sorghums in northern Italy [cf. 2695] showed Camelsorgo BF to be late in maturity; the highest yield of forage was obtained from Beefbuilder and Siloking.

3957 Naldi, L.
I sorghi ibridi nel 1959. **(Hybrid sorghums in 1959).**
Sementi elette 1960 : **6** : No. 2 : 40–44.

The 1959 season was relatively wet and cool and although the hybrid sorghums again proved their worth for Italian conditions, the most successful hybrids were not always the same as in 1958 [cf. XXIX, 3879]; early hybrids such as Beefbuilder, which can be used for either grain or fodder, gave relatively good yields and are gaining in popularity and tests are being instituted with sorghum x Sudan grass hybrids.

3958 Favero, A.
Sorghi ibridi. **(Hybrid sorghums).**
Sementi elette 1960 : **6** : No. 2 : 49–52.

Descriptions are given of Rocket, Ranger, Beefbuilder and Siloking [cf. 3957].

3959 Davies, F. F.
**Performance tests of sorghum varieties and hybrids 1959.**
Misc. Publ. Okla. agric. Exp. Sta. 1960 : No. MP–60 : unpaginated.

The results of trials of 56 grain and 14 forage

* 322 in English summary.

sorghums in different localities in Oklahoma are tabulated. Most of the entries were hybrids of commercial origin or released from experimental stations.

3960 Demidenko, B. G.
**(The floral biology and production of hybrids in *Sorghum*).**
Dokl. Vsesojuzn. Akad. sel'skohozjajstv. Nauk Lenin. (Proc. All-Un. Lenin Acad. agric. Sci.) 1959 : No. 5 : 21–25. [Russian].

An account of breeding *Sorghum* at Dnepropetrovsk, together with descriptions of new high-yielding hybrids, including some with sterile pollen, is given. Hybrid 698 (Rannij Jantar Dnepropetrovskij [Early Dnepropetrovsk Amber] x Kao-liang 120) is productive of grain and nutritious forage with a low HCN content; it yields 18–20% more green matter than the higher-yielding parent. Hybrid 750 (Hybrid 698 x Ukrainian 107) is also grown for grain and forage, the respective yields being 25 and 150 c. per ha. Belozernoe 5 [White-grained 5], obtained by family-group selection from Kafrskoe Beloe [White Kaffir] x Ukrainian 107, is an early grain type with a yield of 28·8 c. per ha. Male-sterile forms were found among the hybrids of Kafrskoe ♀ with Majlo Rannee [Early Milo] ♂ and Ukrainian 107♂, also among the hybrids of Hegari ♀ with Majlo Rannee and Ukrainian 107 ♂. Forms characterized by male sterility differed from the normal plants by the shape, size and colour of anthers. It is thought that the sterile forms may be valuable for breeding new high-yielding *Sorghum* hybrids suitable for combine harvesting.

3961 Endrizzi, J. E.
**The division of univalent chromosomes and a chromosome derivative in *Sorghum*.**
Caryologia 1958 : **11** : 202–16.

A study was made of the meiotic division of univalents in *S. vulgare* with $2n + 1$, *S. halepense* ($2n = 40$), *S. almum* ($2n = 40$), *S. vulgare* x *S. halepense* ($2n = 40$ or 30), *S. vulgare* x *S. almum* ($2n = 30$, 39 or 40) and *S. almum* x *S. halepense* ($2n = 39$ or 40). The frequency of dividing univalents at meiosis I tended to be higher in the species than in their hybrids, while in the latter the frequency of such univalents depended on the degree of homology between the genomes. A small centric fragment in an *S. vulgare* plant with $2n = 20$ was consistently observed to lie in the equatorial plate at metaphase I and divided in 97·7% of the anaphase I cells.

3962 Veeraswamy, R.
**Jowar Co. 19.**
Indian Fmg. 1960 : **10** : 20–21.

Co. 19, the most recent release from the Millets Breeding Station, Coimbatore, combines higher yielding capacity with greater adaptability than the standards Co. 2 and Co. 3. Derived from a mutant with pearly-white grain isolated from Palaki jola, a type with chalky-white grains, Co. 19 is suitable for the whole of Madras state.

3963 Katarki, B. H.
**"G.S.560-1-1" an improved *rabi* jowar variety for Dharwar district.**
Mysore agric. J. 1960 : **35** : 24–28.

In the above district, Mysore State, the sorghum GS560–1–1 has outyielded the local white-grained variety from which it was selected.

3964 Niqueux, M.
Relations entre certains caractères de la panicule et le rendement chez *Sorghum elegans* (Snow.). [**Relations between certain characters of the panicle and yield in *S. elegans* (Snow.)**].
Agron. trop., Nogent 1960 : **15** : 47–53.

A negative correlation was found between weight of panicle and number of whorls of secondary branches on the panicle in tests with 86 lines of *S. elegans*. Selection of lines with three or less whorls is recommended.

## RICE

3965 **(Breeding new varieties of rice in the province of Kwangtung during the last ten years).**
Nung-yeh-hsueh Pao (J. Agric.)/Act. agric. sin. 1960 : **11** : 20–29. [Chinese].

The rice breeding programme at the Kwangtung Agricultural Research Station is outlined and descriptions are given of 13 new early varieties and 10 new late varieties bred there.

3966 Brown, F. B.
**Rice variety trials in Malaya, 1954-58.**
Bull. Dep. Agric. Malaya 1959 : No. 109 : Pp. 80.

A report is given of the results of 54 trials carried out at 39 stations to assess the yielding ability of 295 strains of 69 varieties.

3967 Pruckov, F. M.
**(Rice cultivation in China).**
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1959 : No. 5 : 97–102. [Russian].

Information on the origin, evolutionary history and systematics of cultivated rice in China is

presented [cf. XXIX, 390]. The breeding work now in progress is mentioned briefly and the principal ecological forms and varieties are listed.

3968 Lewis, R. D.
**New varieties open new horizons for US rice.**
Rice J. 1959 : **62** : No. 9 : 10, 12, 14.
The advances in rice improvement which are expected from current breeding projects in the USA and which will provide new opportunities as regards utilization and consumption are described.

3969 Ramirez, D. A., Sajoso, & Bernardo, F. A.
**Inheritance studies in rice.**
Philipp. Agric. 1960 : **43** : 494–503.
Crosses between five early-maturing *japonica* varieties as ♀ parents and late-maturing FB–24 (Fortuna x Seraup Besar) as ♂ were investigated. FB–24 had "runners" and purple leaf sheath, apiculus and stigma. The other parents lacked pigmentation and runners. Anthocyanin pigmentation of the apiculus depended upon two complementary genes (*A*, *C*) and that of the stigma upon these two genes and a third (*Sp*), [cf. XXVIII, 1694]. Leaf-sheath coloration was determined by two, three or four pairs of genes, $F_2$ ratios of 9 : 7, 27 : 37 and 81 : 175 being obtained, depending on the cross. Number of days from sowing to heading in the $F_2$ was nearer the number for the early-maturing parent than for FB–24. Two crosses segregated for the character of runners. In one, the $F_2$ ratio of nonrunners : runners was 15 : 1, providing evidence of duplicate genes, but a 13 : 3 ratio in the other cross suggested the action of an epistatic gene. A more complicated mode of inheritance is however suspected to be in control of runner production, on account of the different results from these two crosses and absence of segregation for this character in the others.

3970 Mizushima, U. & Kondo, A.
**Structural difference of chromosomes between a Japanese and an Indian rice variety proved by anomalous mode of segregation in apiculus anthocyanin pigmentation in their hybrid.**
Tôhoku J. agric. Res. 1959 : **10** : 241–61.
From further investigations on the anomalous segregation for apiculus colour in Norin 1 [Ministry of Agriculture and Forestry 1] x Surjamkhi [cf. 2703], it is concluded that the position of locus *C* differed in the two parental varieties. The results for *Sp* were inconsistent.

3971 Jodon, N. E.
**Occurrence and importance of natural crossing in rice.**
Rice J. 1959 : **62** : No. 8 : 8, 10.
A popular account is given of a study of natural crossing in the USA, from which it has been concluded that 1% natural crossing between plants at a distance of 1 ft. is probably of fairly common occurrence. The significance of natural crossing is discussed with reference to varietal improvement, the production of hybrids with red rice and varietal purity.

3972 Caffey, H. R.
**The behavior of hybrid sterility in an intervarietal cross of *Oryza sativa* L.**
Diss. Abstr. 1959 : **20** : LC Card Mic 59–3071 : 1132–33. (Abst.).
Data obtained on percentages of seed set and stainable pollen in the $F_1$–$F_3$ of a cross between two varieties (unspecified) could be explained most satisfactorily on the basis of structural differentiation of the parental chromosomes.

3973 Yang, M.-H.
**(Preliminary observations on experiments on hybridizing rice and Kweichou *Echinochloa*).**
Nung-yeh-hsueh Pao (J. Agric.)/Act. agric. sin. 1960 : **11** : 77–82. [Chinese].
It is reported that highly fertile hybrids have been obtained at the South China Agricultural Research Station by fertilizing an $F_4$ rice hybrid emasculated by the hot-water technique with pollen of the above form of *Echinochloa*. Descriptions and figures of the hybrid are given.

3974 Relazione della giuria in merito al concorso selezione sementi di riso—1955.
**(Report of the jury concerned at the 1955 competition for rice seed selection).**
Ann. Staz. sper. Risicolt. Colt. irrig. 1959 : **3** : 101–03.
The majority of entries were for the variety Americano 1600, followed by Arborio, Balilla and Rinaldo Bersani. There were two new varieties, one unnamed and the other named Lomello.

3975 Crane, L. E.
**New rice variety, "Gulfrose", introduced.**
Rice J. 1959 : **62** : No. 13 : 2–3, 17.
Developed at the Rice-Pasture Experiment Station, Beaumont, Tex., Gulfrose [CI9416

(Bruinmissie selection x Zenith)] is early maturing, medium grained and resistant to white leaf and blast. It is comparable with Zenith in milling grade and with Blue Rose in cooking quality. It has undergone very little lodging, except on highly fertile soil.

3976 Yan, Y.-R. [Yen, Y.-J.] & Pao, W.-K.
**(Studies on the technique of breeding cereal crops utilizing polyploidy. I. Tetraploid rice).**
Nung-yeh-hsueh Pao (J. Agric.)/Act. agric. sin. 1960 : **11** : 1–19. [Chinese].
Colchicine-induced strains have been obtained of varieties of the Hsien and Keng types and of $F_1$ Hsien-Keng hybrids. The number of quadrivalents in the tetraploids ranged from 3 to 11 with the mode at 7–8. Tetraploid Hsien and Keng strains showed reduced fertility compared with the parental diploids, the Keng varieties being the more adversely affected. In the Hsien-Keng hybrids, on the other hand, the tetraploids were much more fertile than the diploid progenitors. Highly fertile segregates have been obtained in advanced generations of crosses of Hsien and Keng varieties at the tetraploid level.

3977 Murata, Y. & Osada, A.
**(Studies on photosynthesis in rice. XI. The relation between light-receiving efficiency and dry-matter production during the early stages of the growth of rice varieties).**
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1959 : **27** : 422–25. [Japanese].
This investigation into the components of photosynthetic efficiency provides information on the leaf area ratio, relative growth rate, tillering capacity, plant height, leaf thickness, net assimilation rate, photosynthetic capacity per unit leaf area, and light-receiving efficiency of nine varieties and on the relationships of these various components and their variation during plant development [cf. XXIX, 1577].

3978 **(Studies on the differentiation of the growing point in rice. I. Varietal differences).**
Chi-wu-hsueh Pao (J. Bot.)/Acta bot. sin. 1960 : **9** : 113–19. [Chinese].
Morphological intervarietal differences in the differentiating shoot apex are only slight but marked differences occur in the rate at which the sequence of stages takes place.

3979 Misra, G.
**Influence of day length on sterility in rice.**
Curr. Sci. 1960 : **29** : 105–06.
In investigations on 18 varieties at Ravenshaw College, Cuttack, India, short photoperiods brought about a greater reduction in seed fertility, compared with the controls, than long photoperiods. Treatment of plants 30–60 days old was more effective in decreasing fertility than seedling treatment. Varieties belonging to the same maturity group showed wide differences in the percentage sterility caused by a given photoperiod.

3980 Seetharaman, R.
**The inheritance of iodine value in rice and its association with other characters.**
Diss. Abstr. 1959 : **20** : LC Card Mic 59–3083 : 856–57. (Abst.).
Inheritance of amylose content in terms of iodine value was studied in a cross between Texas Patna and Toro, respectively having a low and high iodine value. The lower the iodine value, the higher is the amylose content. Iodine value depended on one pair of major genes and several modifiers, with low value partially dominant. A heritability estimate of 98% was obtained from the regression of $F_3$ means on $F_2$ plant values, indicating that selection for iodine value on an individual-plant basis would be highly effective. Plants with high values had a strong tendency to be early in maturity. A correlation coefficient of 0·41 was found between iodine value and apiculus colour in the $F_2$. Probably one or more of the genes for each trait are linked. The correlation coefficient was much lower in the $F_3$. Low correlation coefficients of −0·13 and −0·02 were obtained between iodine value and hull colour in the $F_2$ and $F_3$ respectively.

3981 Peltier, M. A. G.
Note sur la biologie florale du riz cultivé (*Oryza sativa* L.) dans les conditions du Lac Alaotra (Madagascar). [**A note on the floral biology of cultivated rice (*O. sativa* L.) in the conditions obtaining at Lake Alaotra (Madagascar)**].
J. Agric. trop. Bot. appl. 1959 : **6** : 469–81.
Information is given for 14 varieties on the time of panicle exsertion, time between the opening of the first and last flowers on the panicle, duration of the flowering period of the whole plant, order of flowering of the panicles of a

single plant, order of flowering of the spikelets of a single panicle and the time of day of maximum flowering.

3982 Butany, W. T. & Seetharaman, R.
**A new type of clustering in rice.**
Curr. Sci. 1960 : **29** : 188–89.

A few plants of AC3776 bore bunches of 10–48 spikelets. This type of clustering, designated super-cluster, proved to be monogenic (*SCl*) and partially dominant over the simple type (*Cl*) found in AC1224, characterized by a continuous arrangement of groups of 3–5 spikelets, together with some single spikelets.

3983 Campos, F. F. & Espiritu, L. G.
**Correlation studies of the endosperm and embryo size of the Philippine recommended rice varieties.**
Philipp. Agric. 1959 : **43** : 478–79.

In three out of seven lowland varieties and in all but one of seven upland varieties, correlation between endosperm and embryo size was not significant. In the remaining three lowland varieties, it was positive and significant. The possible relevance of these results to the interpretation of data on varietal disparities in sensitivity to X rays is briefly considered.

3984 Tin [Ting], P.-T. & Kang, C.-N.
**(Morphological observations on multiple grains in rice).**
Chi-wu-hsueh Pao (J. Bot.)/Acta bot. sin. 1960 : **9** : 98–104. [Chinese].

Descriptions are given of various floral aberrations, in particular supernumerary stamens and carpels, in the varieties Yu-Shih 3 and Ho-chuan multiple-grained rice. The breeding value of multiple-kernelled grains is briefly considered.

3985 Watabe, T. & Umekage, O.
**(On the characteristics of reserve starch in the various parts of glutinous rice plants).**
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1959 : **27** : 441–42. [Japanese].

A comparative study of $x$, $2x$ and $4x$ strains of glutinous varieties showed that, in each case, glutinous starch is confined to the pollen and endosperm. In both $2x$ and $4x$ strains, the endosperm starch consists almost entirely of amylopectin.

3986 Nagato, K. & Kobayashi, Y.
**(On intervarietal differences in the starch-cell tissue of rice grains).**
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1959 : **27** : 443–45. [Japanese].

From a comparative study of the appearance in cross section of the grains of a series of mainly Japanese varieties, three varietal groups could be distinguished: (1) with the endosperm cells developed equally well along all radii, represented by foreign varieties, upland rice, glutinous rice and irrigated varieties with hard endosperm; (2) with the endosperm cells compressed along the dorsoventral diameter, represented by varieties used in preparing rice wine; and (3) an intermediate group, represented by irrigated rices with soft endosperm.
In varieties of group (1), specific gravity increases as the centre of the grain is approached. In (2), specific gravity is highest in the midradial zone, while in (3) the midradial zone and centre of the grain are of equal density, the outer zone being of lower specific gravity as in the other groups.

3987 Piacco, R.
Introduzione di varietà di riso USA. **(Introduction of rice varieties from the USA).**
Sementi elette 1960 : **6** : No. 2 : 12–20.

The characteristics of the rice cultivars grown in the USA are outlined and the results of trials with 35 of them in Italy are reported. Many of them failed to reach maturity, others matured too late or gave very low yields. The three varieties Bluebonnet x CP231, Patna and Sunbonnet mature but their grain is deemed too small and thin for the Italian market. The only one thought promising is Cody on account of its yielding ability and strong straw; a selection of it, named Originario Lencino, has been released and may provide a substitute for Americano 1600.
Certain other varieties are being used as parents and a selection from P6 x P6 x Blue Rose is considered promising.

3988 Tinarelli, A.
L'allettamento: varietà e pratiche colturali. **(Lodging: varieties and cultural practices).**
Riso, Milano 1960 : **9** : No. 4 : 16–19.

Among the common rice varieties, Balilla, Balilla a grana grossa [Large-grained Balilla] and Ronco are mentioned as the only ones with a reasonable degree of resistance. Among those classed as semifine, the best in quality, Maratelli, is deficient in resistance, but Stirpe 136 [Strain 136], Roncarolo and Precoce Corbetta [Corbetta Early] are mentioned as satisfactory. The most resistant in the fine class are Rizzotto, Gigante Vercelli [Vercelli Giant], R82, Sesia and Arborio, though Rizzotto

is susceptible to *Sclerotium oryzae*. Various cultural factors that affect lodging are enumerated.

3989 Smith, G. T.
**Two promising rice selections get 'outfield' tests in Texas.**
Rice J. 1959 : **62** : No. 5 : p. 8.

The selections referred to are CI9416 (Bruinmissie selection x Zenith) and PI215936 (Hoari* type from Taiwan). The former shows promise as an early-maturing, medium-grained variety. The latter is short-grained, with short, strong straw and grain and milling qualities comparing favourably with those of Coloro. Both have exhibited resistance to white leaf.

3990 **A step ahead of hoja blanca.**
Agric. Res., Wash. 1960 : **8** : No. 9 : 3–4.

Rice breeding for resistance to white leaf in the USA is outlined.

## FORAGE GRASSES

3991 Harlan, J. R.
**Breeding superior forage plants for the Great Plains.**
J. Range Mgmt. 1960 : **13** : 86–89.

The main trends in grass and legume breeding in the Great Plains region of the USA are outlined and suggestions made as to future lines of improvement.

3992 Rod, J.
Možnosti technického řešení zkoušky hromadným křížením při šlechtění trav. (**Possibilities of a technical solution of the polycross test in grass breeding**).
Sborn. vysoké Škol. zeměd. les. Brné 1958 : **1** : 55–69.

Various systems used for arranging the components of a polycross test are analysed and it is shown that none of these systems results in uniform pollination of all the components. An improved arrangement which has been tested at the Research Institute of Pohořelice is described; it is suitable for determining general and specific combining ability and the degree of self fertility.

3993 Sosulski, F. W., Patterson, J. K. & Law, A. G.
**The lignin content of grass strains.**
Agron. J. 1960 : **52** : 130–34.

At the time of flowering, significant differences in lignin content were recorded in 22 strains representing 4 grass species. Strains which were particularly low in lignin include *Dactylis glomerata* 'Latar', *Bromus inermis* 'Oklahoma 56', *Agropyron intermedium* 'Nebraska 50' and *A. desertorum* 'Fairway'.

3994 Mühle, E.
Zur Frage des Resistenzverhaltens der Gräser gegenüber bakteriellen und pilzlichen Krankheitserregern. (**On the problem of the resistance of grasses to the causal agents of bacterial and fungal diseases**).
Biol. Zbl. 1959 : **78** : 622–30.

Details of the host range and specificity of isolates of *Puccinia coronata, Erysiphe graminis* and *Pleospora bromi* are given. The host range of rust from *Arrhenatherum elatius* was very much smaller than that of isolates from *Lolium multiflorum* and *Festuca pratensis*; the isolates from these two species probably belonged to a single race. Mildew isolates from cocksfoot and *Trisetum flavescens* were specific to their original hosts, those from *F. pratensis* and *L. perenne* appeared to be identical, and those from different varieties of *Poa pratensis* were similar in host range but different in aggressiveness. Of 30 *Bromus* species tested with *P. bromi*, 17 were highly resistant, but all varieties and breeding lines of *B. inermis* proved susceptible.

3995 Stebbins, G. L. & Zohary, D.
**Cytogenetic and evolutionary studies in the genus *Dactylis*. I. Morphology, distribution, and interrelationships of the diploid subspecies.**
Univ. Calif. Publ. Bot. 1959 : **31** : Pp. 39.

Cytotaxonomic investigations were carried out at Davis and Berkeley, Calif., on plants raised from seed collections of the *D. glomerata* complex, made chiefly in Mediterranean and Middle East countries. From observations on pollen and seed fertility in the diploids and their hybrids, it is concluded that the $2n = 14$ subspecies are in general interfertile and able to exchange genes with one another. Meiosis was regular in all the diploids and their $F_1$ hybrids. Eleven diploid subspecies of *D. glomerata* are recognized and described in detail. Six (*himalayensis, aschersoniana, woronowii, reichenbachii, juncinella* and *smithii*) have been previously described as distinct *Dactylis* taxa, while the remaining five (*judaica, ibizensis, lusitanica, santai* and *mairei*) are recognized for the first time. With respect to both morphology and ecological preferences, four extreme types, represented by ssp. *himalayensis, juncinella,*

*Presumably a Penglai (= Horai) type.

*ibizensis* and *smithii*, may be distinguished. The remaining subspecies are intermediate between two or more of these four in both morphology and habitat. Suggestions are made as to the possible phylogeny of the diploid subspecies, with reference (1) not only to the present patterns of geographical distribution of these taxa but also to those of the other species, particularly the woody plants, with which they are associated, and (2) to information on the geology and paleobotany of the regions concerned. The classification and relationships of tetraploid forms of *Dactylis* and the problem of delimiting species in the genus are discussed. The view is expressed that recognition of a single species with two parallel series of subspecies, one on the diploid and the other on the tetraploid level, offers the most practical and theoretically sound approach to the latter problem. It is also believed that introgression of genes from diploids to tetraploids via triploid hybrids has been an important mode of enriching the genetic variability of the tetraploids and of reducing morphological divergence between diploids and tetraploids.

3996 Bradshaw, A. D.
**Studies of variation in bent grass species, II. Variation within *Agrostis tenuis*.**
J. Sports Turf Res. Inst. 1959 : **10** : No. 35 : 6–12.

Spaced-plant observations on samples taken mainly from the neighbourhood of Aberystwyth, Wales, revealed considerable variation in morphological characters, not only between but also within populations [cf. 1614]. Physiological differences were also found between populations, as indicated by highly specific local adaptabilities, including tolerance of lead or other toxic metals [cf. XXIX, 1614]. The observations are discussed with reference to the development of improved varieties for sports turf.

3997 Bradshaw, A. D.
**Population differentiation in *Agrostis tenuis* Sibth. III. Populations in varied environments.**
New Phytol. 1960 : **59** : 92–103.

Samples of 60 tillers from each of a number of populations from altitudes of 10–2500 ft. were transplanted in various contrasting habitats near Aberystwyth, Wales, and their growth compared. Population differences in ability to tolerate different conditions were similar in magnitude and pattern to those already found for morphological characters [cf. 1614]. The behaviour of each population could always be related to its original environment, the population from a lead mine, for example, being tolerant of lead-contaminated soil while one from a normal pasture was not. The physiological differentiation detected was not necessarily accompanied by morphological differentiation, probably because the two types of differentiation result from the action of unrelated environmental factors.

3998 Hunt, I. V.
**Comparison of production from six cultivars of timothy 1954-1957.**
Res. Bull. W. Scot. agric. Coll. 1959 : No. 27 : Pp. 39.

A report is given of a trial carried out on Scotch, Scotia, Swedish, McGill & Smith 90, S48 and S51 at Auchincruive, West Scotland.

3999 Copeman, G. J. F., Brown, W. J. & Alexander, C. B.
**The productivity of herbage varieties. 3. Timothy, 1954 to 1957.**
Bull. N. Scot. Coll. Agric. 1960 : No. 7 : Pp. 24.

A report is given on a trial of Scots, Scotia, Swedish, McGill & Smith 90, S48 and S51 at the Grassland Experimental Centre, Muchalls, Kincardineshire, Scotland.

4000 Christie, B. R. & Kalton, R. R.
**Inheritance of seed weight and associated traits in bromegrass, *Bromus inermis* Leyss.**
Canad. J. Pl. Sci. 1960 : **40** : 353–65.

Among 71 $S_0$ and $S_2$ clones of diverse origin in a polycross nursery, weight per 300 seeds ranged from 0·71 to 1·30 g. A correlation of 0·25 was noted between seed weight and open-pollinated seed set for these clones. Polycross progenies of the clones had a weight per 300 seeds ranging from 0·74 to 0·94 g.; the progeny-parent regression value for seed weight was not significant, while the correlation between progeny and parental means was significant at the 1% level. Inbred progenies of ten clones were evaluated for (1) seed weight, (2) fertility, (3) seed yield and (4) flowering date. In each family, segregation occurred for the first three traits. Inbreeding depression for (1), (2) and (3) respectively averaged 21, 20 and 53% for the $S_0$–$S_1$ in 7 families and 19, 24 and 66% for the $S_2$–$S_3$ in 3 families. Inbreeding led to a delay of 1–2 days in flowering on the average. Progeny-parent regression and correlation values for the four characters were all significant. The regression value for seed weight (0·39) was

equal to that for yield but lower than that for fertility (1·19) or flowering date (0·78). Correlations between (1), (2) and (3) were all positive. [Cf. 1210].

4001 Walters, M. S.
**Rates of meiosis, spindle irregularities and microsporocyte division in *Bromus trinii* x *B. carinatus*.**
Chromosoma 1960 : **11** : 167–204.

An account is given of the meiotic irregularities observed in a cross involving *B. trinii* ($2n = 42$) and *B. carinatus* ($2n = 56$). It appears that (*a*) the rate of meiosis is variable among individual microsporocytes, (*b*) the multipolar (generally tripolar) spindles observed may originate by the splitting of compound spindle organizers, and (*c*) such splitting may occur at various times throughout the meiotic cycles. It is further suggested that spindle organizers repel one another, most effectively during spindle formation, but also to some extent during other stages of meiosis. It was found that cell division tends to be delayed in older anthers.

4002 Tossell, W. E.
**Early seedling vigour and seed weight in relation to breeding in smooth bromegrass, *Bromus inermis* Leyss.**
Canad. J. Pl. Sci. 1960 : **40** : 268–80.

Variability in early seedling vigour was studied in (*a*) polycross progenies from highly selected plants rated as good in other agronomic characters and (*b*) open-pollinated progenies from previously unselected $S_0$ individuals. In both groups, differences were found in (1) rate and (2) percentage of emergence, (3) height at 28 days and (4) vigour (rated according to height and size of stem and leaf) at 28 days. In most progenies, these four attributes were associated. Seed weight was closely associated with early seedling vigour. Plants differed widely in seed weight. In breeding for early seedling vigour, most rapid progress can probably be achieved by screening initial material for seed weight. Since, however, seed weight did not account for all the differences in seedling vigour, progenies from parents having high seed weight should be tested for seedling vigour. The close correspondence between greenhouse and field observations on early seedling vigour indicated that at least preliminary screening for this character may be effected in the greenhouse.

4003 Reusch, J. D. H.
**The nature of the genetic differentiation between *Lolium perenne* and *Festuca pratensis*.**
S. Afr. J. agric. Sci. 1959 : **2** : 271–83.

The percentage of seed set after reciprocal hybridization between *L. perenne* and *F. pratensis* was only slightly lower than that obtained from intraspecific crosses. With *L. perenne* as ♀ parent, the seeds were small, plump and variable in size but with this species as ♂ parent they were fully developed in length but devoid of endosperm. With *L. perenne* as ♀ parent, highly significant differences in germination percentage were noted between different genotypic combinations. Genotypic disparities could not be detected in reciprocal combinations because of the lack of seed viability. Female and pollen fertility in the $F_1$ hybrids was extremely low. A higher seed set was secured from back crosses with *L. perenne* than from those with *F. pratensis*. The $BC_1$ to *F. pratensis* was morphologically intermediate between the parent species, whereas the $BC_1$ to *L. perenne* consisted mainly of plants indistinguishable from pure *Lolium* types. The former back cross produced no good pollen but many plants in the latter had as high a pollen fertility as the parent species. It is suggested that in back crosses with *F. pratensis* only "those $F_1$ gametes which contain mainly *L. perenne* nuclear material develop into seeds, and that owing to segregational sterility reversion to parental type and fertility may not be possible." It is further suggested that the relatively frequent occurrence of natural hybrids reported for certain localities in Britain is probably due to the presence of genotypes possessing a high degree of interspecific seed compatibility.

4004 Reusch, J. D. H.
**Embryological studies on seed development in reciprocal crosses between *Lolium perenne* and *Festuca pratensis*.**
S. Afr. J. agric. Sci. 1959 : **2** : 429–49.

For a period of 48–72 hr. after pollination, the growth rate of the endosperm in seeds resulting from reciprocal hybridization between *L. perenne* and *F. pratensis* did not differ from the rate in the corresponding seed-parent control when pollinated intraspecifically. Marked interspecific and intraspecific differences were found between the seed-parent controls. At 72 hr. after pollination and subsequently, considerable disparities in endosperm behaviour were observed

between reciprocal crosses. In seeds from *L. perenne* ♀ x *F. pratensis*, cell formation took place precociously, the majority of nuclei becoming pycnotic and further division being suppressed. With *F. pratensis* as ♀ parent, cell formation did not occur; in one of the two crosses studied the endosperm continued growth at a rate similar to the control but in the other it was retarded. In both crosses, various mitotic irregularities appeared which finally resulted in complete breakdown of the tissue. In all crosses, rate of embryo development was similar to that in the seed-parent controls, until lack of nutrients, a consequence of endosperm failure, brought about collapse of the embryo. It is concluded that disparities in seed compatibility between different genotypic combinations of *L. perenne* ♀ x *F. pratensis* ♂ depend upon the amount of endosperm produced before cell formation. It is postulated that the anomalous behaviour of the endosperm in the hybrid seeds results from disturbances in nucleic acid metabolism and that this disturbance is in turn a consequence of an unfavourable nuclear-cytoplasmic relationship.

4005 Reusch, J. D. H.
**Note on the nature of the effect of the environment on seed-viability in interspecific hybrids.**
S. Afr. J. agric. Sci. 1959 : **2** : 573–74.

In *Lolium perenne* x *Festuca pratensis*, 54·1% of the seeds were viable when the pollinations were made during a warm and dry spell but seeds derived from pollinations effected during a cold, moist period failed to germinate. The degree of viability of the hybrid seeds is determined by the rate of endosperm growth prior to cell formation [cf. 4004]. The variable amounts of success reported from time to time for this cross are possibly attributable to the influence of environmental factors, particularly temperature, upon the initial rate of endosperm development.

4006 Reusch, J. D. H.
**The effects of gamma-radiation on crosses between *Lolium perenne* and *Festuca pratensis*.**
Heredity 1960 : **14** : 51–60.

In further investigations [cf. 4003–4] the author studied the effect of $\gamma$ irradiation of the pollen and ovules upon compatibility between the above species. Ovule treatment led to a progressive decrease in seed set with increase in dose and almost without exception had no significant effect upon viability. In *L. perenne* ♀ x *F. pratensis* ♂, pollen irradiation did not in general raise the germination capacity over that of caryopses of the controls. Combinations normally giving viable seeds showed a decrease in the production of such seeds with pollen treatment with 250–500 r., followed by recovery at higher doses (1000–2000 r.). The amount of reduction in viability at the lower doses and increase at higher doses varied according to the parent genotypes. Seed set showed a similar pattern of reduction and recovery at these doses. Pollen irradiation had no effect on normally incompatible combinations of *L. perenne* ♀ x *F. pratensis* ♂. With untreated pollen, no viable seeds were secured from *F. pratensis* ♀ x *L. perenne* ♂. In three combinations out of six, however, viable seeds were produced when treated pollen was used, genotypical disparities in response to irradiation being noted. It is suggested that the initial reduction in viability at lower doses is a consequence of endosperm degeneration in a proportion of ovules as the result of fertilization by chromosomally damaged pollen grains. The increase with higher doses is considered to be due to gene changes which reduce the genetic unbalance within the endosperm and thus allow this tissue to undergo improved development.

4007 Reeves, J. T. & Fisher, H. M.
**The "Merredin Early" strain of Wimmera ryegrass.**
J. Agric. W. Aust. 1960 : **1** : 353–54.

Merredin Early is a prolific selection maturing about ten days before commercial Wimmera ryegrass. Because of its early maturity, the strain is able to become established and to persist in drier districts with a shorter season, where the commercial stock has failed. It is also more suitable than later strains for use in reclaiming areas with high salinity, persists better in subterranean-clover pastures and gives better reestablishment after cereal cropping.

4008 Buckner, R. C. & Fergus, E. N.
**Improvement of tall fescue for palatability by selection within inbred lines.**
Agron. J. 1960 : **52** : 173–76.

A sufficient number of inbred lines of *Festuca arundinacea* 'Gl–25' were maintained through four generations to suggest that selection from inbred lines might be used successfully for improving palatability in tall fescue. After three generations of selfing the lines were said to be "somewhat homozygous for palatability to cattle".

4009 Buckner, R. C.
**Performance of inbred lines, polycross progenies, and synthetics of tall fescue selected for improved palatability.**
Agron. J. 1960 : **52** : 177–80.

The palatability and agronomic performance of polycross progenies and synthetics of inbred lines of *Festuca arundinacea* were found to compare favourably with that of commercial varieties in trials conducted at the Kentucky Agricultural Experiment Station.

4010 Wilson, J. A. & Holt, E. C.
**Role of the male gametophyte in dallisgrass reproduction.**
Agron. J. 1960 : **52** : 134–37.

While the growth of pollen tubes into the ovule was essential for endosperm formation in both the common and the yellow-anthered strains of *Paspalum dilatatum*, only in the yellow-anthered strain was this a prerequisite for proembryo formation; in the common strain, embryogenesis proceeded independently of pollen tube entry.

4011 Forbes, I. (Jun.).
**A rapid enzyme-smear technique for the detection and study of plural embryo sacs in mature ovaries in several *Paspalum* species.**
Agron. J. 1960 : **52** : 300–01.

Details are given of the killing, mordanting, macerating and smearing stages of the technique, which has been applied to *P. notatum*, *P. almum* and *P. guaraniticum*.

4012 Ketellapper, H. J.
**Growth and development in *Phalaris*. I. Vernalization response in geographic strains of *P. tuberosa* L.**
Ecology 1960 : **41** : 298–305.

Strains from different parts of the native range of the species in the Mediterranean region differed in cold requirement for flowering in experiments at Canberra, Australia.

4013 Mehra, K. L.
**Cytotaxonomic study of the *Dichanthium annulatum* complex.**
Diss. Okla. Univ. 1960 : Pp. 103. (Mimeographed).

A survey of the literature is followed by a detailed account of a study of specimens of the *D. annulatum* complex collected from most of its geographical range, 97 accessions being analysed cytologically and 53 morphologically [cf. 458]. Assuming 10 to be the basic number, 8 diploids, 82 tetraploids and 7 hexaploids were found. In general, four morphological types were recognizable: the tropical, Mediterranean, French West African and South African. All diploids were of the tropical type and all hexaploids of the South African type (*D. papillosum*). The tetraploids consisted of at least five types: (1) the tropical, (2) the tropical type showing evidence of introgression by *Bothriochloa*, (3) intergrading variants between the tropical and Mediterranean types, (4) the Mediterranean type and (5) the latter type showing signs of introgression by *Bothriochloa*. The main features emerging from the cytological and morphological examination tally with the results already reported, while the hypothesis given concerning the origin of the various members of the complex is in most respects essentially similar to the one previously described. The earlier view on the possible mode of origin of the South African type has however undergone revision on the basis of the following findings. Although morphologically all seven hexaploids were of the South African type, they represented two cytological types. One group, comprising accessions from South Africa, was characterized by many univalents and few quadrivalents at metaphase I. Its genome may therefore be formulated as $AAA_1A_1A_2A_3$. In the other type, represented by a single Australian accession, a considerable number of quadrivalents, frequent hexavalents and only a few univalents were observed. The genome formula in this case may be regarded as being $AAAAA_1A_1$. Morphologically, hexaploids of both types seemed to represent combinations of extreme expressions of characteristics of the tropical and Mediterranean groups. One of the $F_1$ hybrids secured by crossing the tropical and Mediterranean tetraploid types proved to have $2n = 60$, and was presumably the result of fertilization of an unreduced egg from the tropical type by a reduced gamete from the Mediterranean parent. It displayed a marked morphological similarity to the South African type. Its $F_2$ contained combinations of the characteristics of the tropical, Mediterranean and South African groups. Attention is drawn to the observation that a few individuals in the $F_2$ produced by selfing $4x$ hybrids from crosses between the tropical and Mediterranean types showed transgression with respect to features of both parents, as well as considerable resemblance to the South African type; it is suggested that such plants could correspond to the initial stage in the evolution of the South African group. Furthermore, it appears that a double dose of

the chromosomes of the tropical type may be required to produce the South African type. The Australian 6*x* accession may have arisen through fertilization of an unreduced gamete from the tropical type by a normal gamete of another member of the *D. annulatum* complex which was more closely related to the tropical than to the Mediterranean type. The origin of the South African group through fertilization of an unreduced egg from the tropical type by a reduced gamete of *D. aristatum* is now considered as highly unlikely, information having been obtained that the latter is an Australian species, its occurrence as an introduction in South Africa being of a local nature.

4014 Townsend, C. E.
**Sterility in Sudangrass: I. barren- and chimeral partial-sterility.**
Agron. J. 1960 : **52** : 153–55.

Barren sterility, characterized by the reduction or absence of floral parts and sexual organs, was found to be controlled by a single recessive gene in *Sorghum vulgare* var. *sudanense*. A type of partial sterility, classified as chimeral partial sterility, in which different degrees of sterility occur among the panicles of a single plant, is also thought to be under genetic control. Since a wide range was found in the degree of sterility in these plants, it is believed that the effects of the major recessive gene or genes may be influenced by the presence of modifying genes. Somatic mutation is also suggested as a possible causal factor.

4015 Hayman, D. L.
**The distribution and cytology of the chromosome races of *Themeda australis* in southern Australia.**
Aust. J. Bot. 1960 : **8** : 58–68.

The basic chromosome number of *Th. australis* is $x = 10$, as has been reported for other species in the genus. Individuals with 2*x*, 3*x*, 4*x*, 5*x* and 6*x* numbers have been identified. Over 98% of the plants examined, which represented over 300 populations below the Tropic of Capricorn, were either diploid or tetraploid. A very clear pattern of distribution of the populations according to chromosome number could be distinguished. Diploids were found in Tasmania, the Eastern Highlands of New South Wales and the central and southern regions of Victoria, their distribution extending only a little way into south-eastern South Australia. The 4*x* populations were distributed across the continent and were in most cases further inland than the 2*x* populations. Triploid, 5*x* and 6*x* individuals occurred in populations characterized by another chromosome number. Cytological observations revealed a very close relationship between the genomes of the polyploids, evidence of the origin of the latter from diploids thus being provided. The relationship between the chromosome races and the significance of the pattern of distribution of the diploid and tetraploid races are discussed.

4016 Sharma, A. K. & Jhuri, L.
**Chromosome analysis of grasses. I.**
Genet. iber. 1959 : **11** : 145–63.

The following somatic chromosome numbers have been found: *Digitaria sanguinalis* var. *cilioma*, 18 and 76; *Panicum flavescens*, 64; *P. colonum*, 56; *Paspalum platycaule*, 40; *Paspalidium flavedum*, 56; *Brachiaria reptans*, 14; *Oplismenus burmannii*, 18; *Leptochloa capillacea*, 20; *Eleusine indica*, 18; and *Dichanthium annulatum*, 20. Caryotype analyses of each species have also been made. When compared with records for other species, the results indicate the importance of polyploidy, aneuploidy and structural chromosome changes in speciation.

4017 Joshi, A. B. & Patil, B. D.
**Pistil-less and functional male-sterile off-type plants in blue panic grass (*Panicum antidotale* Retz.).**
Curr. Sci. 1960 : **29** : p. 63.

One plant with nondehiscent anthers and another without pistils were noticed at the Indian Agricultural Research Institute, New Delhi. When bagged, the former set some seed, presumably as the result of apomixis. The two forms are being used in genetical investigations.

4018 Shama Kumari, K.
**Cytogenetic investigations in Paniceae: Occurrence of apospory in a diploid species of *Panicum*—*Panicum antidotale* Retz.**
Curr. Sci. 1960 : **29** : p. 191.

About 500 ovules of *P. antidotale* ($2n = 18$) were examined. Two showed the presence of multiple embryo sacs whose appearance was suggestive of apospory.

4019 **Normal millet hybrids from dwarf plants.**
Agric. Res., Wash. 1960 : **8** : No. 11 : p. 5.

Forage yields of $F_1$ hybrids resulting from interpollination of dwarf lines of pearl millet have shown that it is feasible to produce seed of Gahi 1 or any similar hybrid by using dwarf

plants, mechanical harvesting thus being facilitated [cf. XXVIII, 4228]. Development of four dwarf lines which give rise to normal progeny when interpollinated was made possible by the discovery of four different genes controlling dwarfness. Crosses between any two dwarf lines result in progeny normal in height. Breeding is in progress to introduce genes for dwarfness in the four parents of Gahi 1 and to develop dwarf counterparts of other inbreds.

4020 **Florida releasing stock of good new turfgrass.**
Seed World 1959 : **84** : No. 8 : p. 29.
Floratine, a new strain of *Stenotaphrum secundatum* released by the Florida Agricultural Experiment Station, is blue-green in colour, grows close to the ground and produces a dense turf. It is well adapted to close cutting and competes effectively against weeds.

4021 Paunero, E.
Las Aveneas españolas. IV. (**The Spanish Aveneae. IV**).
An. Inst. bot. A. J. Cavanilles, Madrid 1959 : **17** : 257–376.
In the fourth part of this monograph [cf. XXIX, 1438], descriptions, illustrations and notes on distribution in the Iberian peninsula are presented for species in the genera *Helictotrichon, Arrhenatherum, Koeleria* and *Gaudinia*; keys to the species are included for each genus.

4022 Larsen, K.
**Cytological and experimental studies in *Koeleria pubescens*.**
Hereditas, Lund 1960 : **46** : 312–18.
The chromosome number of this species proved to be $2n = 12$, one of rare occurrence in the Gramineae. Three out of 15 plants belonging to the same population each had one B chromosome, about three-quarters the length of normal chromosomes. No positive heteropycnosis was observed. Meiosis in $2n = 12$ plants was normal; plants with B chromosomes were not examined meiotically. Plants with and without B chromosomes did not differ morphologically or in flowering behaviour.

4023 Bowden, W. M.
**Chromosome numbers and taxonomic notes on northern grasses. II. Tribe *Festuceae*.**
Canad. J. Bot. 1960 : **38** : 117–31.
In the present paper [cf. 1630], the somatic chromosome numbers of the following are recorded: *Arctagrostis arundinacea* var. *arundinacea*, $2n = 28$, 29 and 30; *A. arundinacea* var. *crassispica*, 56; *A. latifolia*, 56; *Beckmannia syzigachne*, 14; *Brachyelytrum erectum*, 22; *Bromus ciliatus*, 14; *Bromus inermis*, 56; *Bromus kalmii*, 14; *Bromus porteri*, 14; *Bromus tectorum*, 14; *Catabrosa aquatica* var. *laurentiana*, 20; *Dactylis glomerata*, 28; *Distichlis stricta*, 40; *Dupontia fisheri* ssp. *fisheri*, 132; *Dupontia fisheri* ssp. *psilosantha*, 44; *Erempopoa persica*, 28; *Festuca altaica*, 28; *F. baffinensis*, 28; *F. brachyphylla*, 42 and one collection, 44; *F. elatior*, 14; *F. obtusa*, 42; *F. prolifera* var. *lasiolepis*, 50; *F. rubra*, 42; *F. saximontana*, 42; *F. scabrella*, 56 and 28; *Glyceria borealis*, 20; *G. canadensis*, 60; *G. grandis*, 20; *G. melicaria*, 40; *G. pulchella*, 20; *G. striata*, 20; *Glyceria* x *gatineauensis* (*G. melicaria* x *G. striata*), 30; *Glyceria* x *ottawensis* (*G. canadensis* x *G. striata*), three nothomorphs, 42, 46 and 48; *Lolium rigidum*, 14; *Phippsia algida*, 28; *Phippsia concinna*, 28; *Pleuropogon sabinei*, 42; *Schizachne purpurascens*, 20; and *Torreyochloa fernaldii*, 14. Botanical descriptions are given of the new variety *Arctagrostis arundinacea* var. *crassispica*; of the hybrid *Glyceria* x *gatineauensis*; and of the three nothomorphs of *Glyceria* x *ottawensis*, of which the 42-chromosome hybrid is designated *ottawensis* nm. *ottawensis*.

4024 Schaaf, H. M. & Rogler, G. A.
**Vinall Russian wild rye.**
N. Dak. Fm. Res. 1960 : **21** : No. 4 : 4–5.
The release of the synthetic variety *Elymus junceus* 'Vinall' is announced by the North Dakota Agricultural Experiment Station. It is superior to the commercial stock in seed production, seed weight per bushel, weight per 200 seeds and lodging resistance and compares favourably with this stock in hay production.

4025 Hansen, A.
*Elytrigia* (*Agropyron*)-hybrider i Danmark. [***Elytrigia* (*Agropyron*) hybrids in Denmark**].
Bot. Tidsskr. 1960 : **55** : 296–312.
A key is given for the identification of the species *A. juncea* ssp. *boreoatlantica, A. pungens, A. repens* and the three hybrids between them, all of which occur in Denmark. The characters of the hybrids and their distribution are described and notes are also provided on *A. juncea* ssp. *boreoatlantica* x *Elymus arenarius* and *Hordeum secalinum* x *A. repens*, the former distributed around the Baltic coast, the latter found once in Denmark.

4026 **WSC releases Alkar—a salt tolerant wheatgrass.**
Seed World 1959 : **84** : No. 8 : p. 28.
Alkar is a tall, very late-maturing, bunch type

of *Agropyron elongatum* which is well adapted to poorly drained and alkaline soils. It is a coarse grass with long blue-green leaves and abundant culms. Seed production is high and seedling vigour good. Palatability, however, is said to be relatively low. Alkar is a selection from a line introduced from Russia in 1932, and is now being released by the Washington Agricultural Experiment Station.

## LEGUMINOUS FORAGE PLANTS

4027 Larsen, K.
**Stray contributions to the cytology of the vascular plants.**
Bot. Tidsskr. 1960 : **55** : 313–15.

Somatic chromosome numbers are reported for nine species, some of them for the first time, including the following: *Onobrychis supina*, 14; *Vicia oroboides*, 14; *Trifolium usambarense*, 16; and *Ventenata avenacea*, 14. The number 14 was confirmed for *O. montana*. Root-tip metaphase plates are illustrated for all the above species.

4028 Borrego, J., Jasso, R. G. & Sánchez D., N.
Prueba de variedades de alfalfa para el Valle del Yaqui. (**Trial of lucerne varieties for the Yaqui Valley**).
Agric. téc. Méx. 1959–1960 : No. 9 : 14–15.

Among 36 varieties tested in 1958, at Obregón, Mexico, none yielded significantly more than the commonly grown Velluda Peruana [Peruvian Hairy].

4029 Adams, M. W.
**Estimates of variance for root proliferation in alfalfa.**
J. Genet. 1959 : **56** : 395–400.

Twenty-four plants varying in extent of root proliferation were chosen from a spaced-plant nursery of advanced-generation hybrids of *Medicago sativa* x *M. falcata* at Brookings, S. Dakota. Random intercrosses were made by hand among these plants and families of 40 half-sib plants for each of the 24 parental clones were established at Brookings and another centre in the state, together with a replicated clonal nursery of the parents at each centre. Plant spacing was in all cases 3 x 3 ft. Unexpectedly high estimates of genetic variance were obtained for the clones and plants within families with respect to width of "creep". These variances could not be explained by tetrasomy, linkage or epistasis. They could however be largely explained by postulating a positive correlation between genetic and environmental effects; by the methods employed in the analysis, any genotype-environment interaction variance would remain in the genetic effects, giving an upward bias to estimates of genetic variance of individuals. Heritability calculated as the ratio of additive genetic to total variance would thus assume a proportionately low value.

4030 Morley, F. H. W. & Heinrichs, D. H.
**Breeding for creeping root in alfalfa (*Medicago media* Pers.).**
Canad. J. Pl. Sci. 1960 : **40** : 424–33.

In a population consisting of progenies from crosses among 54 plants derived from *M. falcata* x *M. media*, genotypic variation in degree of creeping rootedness was predominantly additive but constituted only about 20% of the total phenotypic variance. Mass selection alone is predicted as being more efficient in breeding for creeping rootedness than a combination of mass selection and progeny testing. Since, however, concomitant selection for other characters will usually be made, the combination of methods may be necessary. In progeny testing, the optimum number of progeny plants per parent should be about 30, provided these are obtained by crossing at least 8–10 unrelated and randomly selected parents.

4031 Lubenec, P. A.
(**Intraspecific and interspecific hybrids of lucerne**).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1959 : No. 4 : 49–57. [Russian].

An account of hybridization carried on with many varieties and wild forms from 1936 to 1958 at the Kuban' branch of the Institute of Plant Industry is given and intervarietal and interspecific hybrids which outyielded Slavjanskaja Mestnaja 475 [Local Slav 475] are listed. The most promising hybrids, productive, tolerant of frost and drought and resistant to disease, were obtained by interspecific hybridization of lucerne cultivars from the Ukraine, the North Caucasus and western Europe with wild *Medicago falcata* from the Krasnodar territory and adjacent districts. The hybrids outyielded Slavjanskaja Mestnaja 475 by 15–30% in the first three generations and were nearly as productive as this from the fourth generation onwards. Open pollination of the hybrids with wild *Medicago falcata* in the third or fourth generation fully restored their productiveness.

4032 Medica F.D. 100. **(Lucerne FD100).**
Sementi elette 1960 : **6** : No. 1 : p. 42.
The variety FD100 recently patented in Italy is described as very early and resistant to lodging, cold and diseases.

4033 Lesins, K.
**Note on a hexaploid *Medicago*: *M. cancellata* M.B.**
Canad. J. Genet. Cyt. 1959 : **1** : 133–34.
Morphological notes are given on this 48-chromosome species. Chromosomes are 2·4 to 4·0 $\mu$ in length and are V to rod shaped. "In some preparations at least one pair of chromosomes showed satellites separated from the main chromosome body by a lengthy gap of chromatic material of low stainability."

4034 Armstrong, J. M.
**Pollen irradiation as a method of inducing variation in alfalfa.**
Canad. J. Genet. Cyt. 1959 : **1** : 110–17.
Pollen of the lucerne variety Aut.3–6–3 was subjected to X-irradiation doses ranging from 2000 to 15,000 r. and used to fertilize the male-sterile variety DRC–20 in order to investigate the possibility of inducing polyhaploidy at high X-ray doses. The range of variation in rate of seedling growth, tillering, leaf size, percentage of viable pollen and seed yield was compared in irradiated and control populations.
No polyhaploid individuals were obtained. While variability in the characters listed was greater in the irradiated progenies, only in leaf size was this advantageous.

4035 Dotzenko, A. D. & Haus, T. E.
**Selection of alfalfa lines for their ability to germinate under high osmotic pressure.**
Agron. J. 1960 : **52** : 200–01.
As already reported, Vernal, Ranger, Buffalo, Lahontan, Caliverde and African differ in ability to germinate in mannitol solutions with high osmotic pressures [cf. XXIX, 3972]. These varieties have since been subjected to intra-varietal selection for ability to germinate in a mannitol solution with an osmotic pressure of 12 atmospheres. Plants raised from seeds which germinated were designated "12" selections, and those from seeds failing to do so, "0" selections. Data on $F_1$ seeds from crosses of the selections within each variety showed the ability in question to be heritable. In all varieties, the germination percentage was higher in $F_1$ seeds from crosses of 12 selections than from crosses of 0 plants. Three phenotypic expressions with respect to germination percentage were observed in the $F_1$ seed from crosses between 0 and 12 selections: (1) an intermediate condition between the 0 and 12 parents, in Vernal and Buffalo, (2) similarity to the 12 parent, in Ranger, Lahontan and Caliverde, and (3) heterosis in African.

4036 Chisci, G. C.
L'impiego delle funzioni discriminanti applicate alle misurazioni fogliari per la differenziazione di alcuni ecotipi di erba medica nella Stazione ecologica di Lodi. **(The use of discriminant functions applied to leaf measurements for differentiating certain ecotypes of lucerne at the Ecological Station at Lodi).**
Genet. agr. 1960 : **11** : 243–67.
Attempts to classify Italian lucerne ecotypes on the basis of one or two morphological features have not proved successful. Observations were made on six ecotypes from different parts of northern Italy, all grown at the experimental station at Lodi in 1955. Outlines of the leaflets of the penultimate leaf from the top at the beginning of flowering were made and the length and breadth of each of the three leaflets were measured; discriminant functions based on only four of the six dimensions were significant at the $P = 0{\cdot}01$ level when calculated for the ecotypes from Cremona and Friuli respectively, which could thus be distinguished satisfactorily by this method. Similar calculations for other ecotypes showed that the ecotype from Cremona could also be distinguished from that from Polesine, that from Bologna from line 202 of the Lodi station and from the Friuli ecotype, that from Polesine from the ecotypes of Cremona, Lonigo and Friuli, that from Lonigo from those from Polesine and Friuli, and line 202 from ecotypes from Bologna and Friuli. Thus the Friuli ecotype can be distinguished from all others whereas most of the other ecotypes are distinguishable from some but not all of the other five. Since the relative position of the ecotypes in respect of yield remains the same in different years it is thought possible that the same may prove true with regard to the leaf dimensions.

4037 Kohel, R. J. & Davis, R. L.
**The inheritance of cold resistance and its relation to fall growth in $F_2$ and $BC_1$ generation of alfalfa.**
Agron. J. 1960 : **52** : 234–37.
A night temperature of 36° F. for 16 hr. and day temperature of 65° F. with natural sunlight

for 2 weeks, followed by freezing uniform root samples at −5° C., proved to be satisfactory as conditions for the evaluation of differences in cold resistance of two-months-old cuttings by determining the specific conductivity of exosmosites from the frozen tissue. Selected $F_2$ plants derived from crosses between three parent clones and selected $BC_1$ individuals were tested for cold resistance by this method. The $F_2$ results were variable but a more refined sampling technique gave a more accurate estimate of resistance for $BC_1$ selections, data on which suggested that cold susceptibility was controlled by partially dominant gene action. Winter survival of $BC_1$ lines in the field was significantly correlated with cold resistance as determined by the conductivity test. In an autumn-simulated environment in the greenhouse, no genetic variation in autumn growth could be detected. In the field, 17% of the total $F_2$ variation in autumn growth, measured by height, was ascribable to additive genetic variation. Variance analysis for $F_2$ and $BC_1$ individuals revealed no significant relationship between autumn growth and specific-conductivity values, but the means for these two properties were positively correlated in $F_2$ and $BC_1$ lines. Mean autumn growth and mean winter survival were negatively and significantly correlated in $F_2$ and $BC_1$ lines. Survival was thus associated with "dormant autumn growth". Only about 25% of the variation in autumn growth was due to its linear association with cold resistance. If "dormant autumn growth" and cold resistance are conditioned by the same genes, this low degree of association could have been caused by variability in the autumn-growth test but, if these characters depend on distinct genes, it could have been due to recombination of these genes.

4038 Elling, L. J. & Frosheiser, F. I.
**Reaction of twenty-two alfalfa varieties to bacterial wilt.**
Agron. J. 1960 : **52** : 241–42.

Seedlings eight weeks old were immersed in a tap-water inoculum of *Corynebacterium insidiosum* for 30 min., cut 2 in. above the crown and transplanted to the field. Three and a half months later, the roots were cross-sectioned for classification. The varieties fell into four general groups, in descending order of resistance: (1) Vernal, (2) Teton, A–600 and Buffalo, (3) Rambler, Ranger and Lahontan, and (4) the remaining 15 varieties. Vernal had 46·2% resistant plants. Most of the varieties in (4) were highly susceptible.

4039 Pearson, L. C. & Elling, L. J.
**Predicting disease resistance in synthetic varieties of alfalfa from clonal cross data.**
Agron. J. 1960 : **52** : 291–94.

With respect to resistance to bacterial wilt (*Corynebacterium insidiosum*) and common leaf spot (*Pseudopeziza medicaginis*), each of three synthetics agreed with the average performance of all possible crosses between the clones which constituted the parents of the synthetic.

4040 Howe, W. L. & Pesho, G. R.
**Spotted alfalfa aphid resistance in mature growth of alfalfa varieties.**
J. econ. Ent. 1960 : **53** : 234–38.

In a study of resistance to *Therioaphis maculata* at Bakersfield, Calif., during 1957, mature stands of varieties of American and foreign origin showed a considerable range in plant injury and suitability for aphid population increase. Varieties rated as resistant, viz. Lahontan, Moapa, Zia, Bam and Sirsa 9, carried low populations and made very good growth under conditions of epidemic infestation at the high day temperatures prevailing at the test site. Forty-three other varieties, classed as intermediate or susceptible, supported heavy populations which caused different degrees of injury. Mortality rates of 2 to over 90% for plants infested by 300 aphids or more per stem were indicative of a wide range in tolerance. Varieties of partial or complete Turkistan origin were generally more tolerant than others. Regrowth of infested varieties after being cut back varied inversely with plant mortality.

4041 Šimkus, G. T.
**(Ecology and geographical distribution of the wild clovers of the Crimea).**
Bot. Ž. (Bot. J.), Moskva 1960 : **45** : 436–41. [Russian].

Of the 65 clover species found in the USSR, 25 occur in the Crimea and details are given of their distribution. *Trifolium hirtum* is unique on account of its drought resistance, though several others are mentioned also for this property. *T. parviflorum* is a halophyte and *T. campestre*, *T. arvense* and certain other species tolerate lower degrees of salinity. Some forms of *T. subterraneum* display a tendency towards a perennial habit and nine species are fully perennial; of these, the most drought resistant is *T. ambiguum*, a species with an uncommonly wide range of adaptation; *T. repens* also contains some drought-resistant forms. Some doubt is expressed concerning the validity of the species *T. hybridum*.

4042 Kovalenko, I. F.
**(Methods of breeding red clovers).**
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1959 : No. 3 : 52–55. [Russian].

The forage and seed yields of White Russian red clovers were increased and their overwintering ability improved by combining different strains of land varieties to form heterogeneous populations in experiments from 1947 to 1957 at Zazer'e. Selecting high-yielding biotypes from a balanced population invariably resulted in deterioration in the selected material. Artificial populations obtained by combining such selections were also less productive than established initial populations.

4043 Pergament, E. & Davis, R. L.
**Differentiation of red clover varieties.**
Agron. J. 1960 : **52** : 258–61.

In a study at Purdue University Agricultural Experiment Station, Ind., Dollard, Pennscott and Kenland were distinguishable by differences in number of flowering stems, proportion of flowering and nonflowering plants, time of flowering, height of flowering stems, and length and number of petioles.

4044 Bingefors, S. & Quittenbaum, G.
Über das Vorkommen von mehrsamigen Hülsen bei schwedischem Rotklee. **(The occurrence of multiseeded pods in Swedish red clover).**
Z. Pflanzenz. 1959 : **42** : 214–22.

After open pollination, considerable variation in the occurrence of multiseeded pods was observed; the strain Merkur showed a higher frequency of multiseeded pods than the strain Ultuna. Progenies from crosses between different families also showed marked differences in this respect, indicating that the tendency to produce multiseeded pods is an inherited character. Environmental conditions also had some effect on the expression of this character. Of the 316,000 pods examined, five contained three seeds and 5000 contained two seeds; seeds from multiseeded pods were smaller than those from single-seeded pods.
It is thought that raising seed yield by selection for multiseeded pods would be of considerable value, especially in tetraploids; no multiseeded pods have so far been found in the tetraploid strain Ulva.

4045 Carnahan, H. L.
**A comparison of 1st and 2nd synthetic generation forage yields of Ladino white clover in association with bromegrass.**
Agron. J. 1960 : **52** : p. 302.

Four unrelated noninbred clones were intercrossed by hand to produce seed of the six possible first-generation two-clone synthetics. The syn. 2 generation was obtained by reciprocally intercrossing several individuals representative of each $F_1$ population. The average of all synthetics for the two years of the test represented a yield decline of slightly more than 18% from the syn. 1 to the syn. 2. The interaction generations x synthetics was nonsignificant. The results suggest that use of more than two clones as a basis of Ladino-clover synthetics may be desirable. In general, differences in yield among the first-generation synthetics tended to be reflected in the corresponding yields of the second-generation synthetics.

4046 Stanford, E. H., Laude, H. M. & Enloe, J. A.
**Effect of harvest dates and location on the genetic composition of the $Syn_1$ generation of Pilgrim Ladino clover.**
Agron. J. 1960 : **52** : 149–52.

By studying genetic markers in the bulked progeny of individual parental clones of the Ladino variety Pilgrim in a polycross nursery, the contributions of the clones as pollen and as seed parents were calculated. Relative contributions were found to be unequal and to be influenced by environment and date of harvest. While clones which are low-yielding at one date tend to be low-yielding at the others, some striking exceptions were noted.

4047 Britten, E. J.
**Genetic and environmental control of flowering in *Trifolium repens* in the tropics.**
Science 1960 : **131** : 100–01.

At Honolulu, at an altitude of 70 ft., collections of *T. repens* obtained in Hawaii showed a wide genetic diversity in tendency to flower, ranging from no to profuse flowering. Clones failing to flower were induced to do so when subjected to warm days and cool nights. It is suggested that reproduction of long-day, temperature-sensitive forage crops at higher elevations in the tropics is triggered off by the low night temperatures or changes in temperature associated with such altitudes.

4048 Lehle, H.
Ein Beitrag zur Kenntnis der Ertragsmerkmale des Weissklees und ihrer Bedeutung für die Züchtung. (**A contribution to knowledge of the yield characters of white clover and their importance for breeding**).
Diss. Landw. Hochsch. Hohenheim 1957 : Pp. 131.
Most of this work has been reported elsewhere [cf. 489].

4049 Carpenter, J. A. & Gladstones, J. S.
**Plant breeding with X-ray induced mutants in Western Australia.**
Australian Atomic Energy Symposium 1958 : 648–50.
Mutants of potential economic value have been induced in blue lupin and subterranean clover. In both crops, variants suitable for genetic marking of new strains have been isolated. In blue lupin, these comprise four different mutants for flower colour and in subterranean clover two mutants for anthocyanin and leaf-marking pattern, another with an altered leaflet arrangement and a fourth with increased pubescence. A blue-lupin mutant with a substantially earlier date of flowering has also been produced, as well as, in subterranean clover, two fertile short-stemmed types with a high leaf : stem ratio and a large-leaved mutant.

4050 Millington, A. J.
**The Geraldton strain of subterranean clover.**
J. Agric. W. Aust. 1960 : **1** : 137–44.
Collected at Moonyoonooka, Western Australia, Geraldton equals Dwalganup in yield of leaf and stem but surpasses it in seed production.

4051 Il'in, M. M. & Truhaleva, N. A.
(**On races of *Trifolium lupinaster* L.s.l.**).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1960 : **132** : 217–22. [Russian].
A more detailed study of *T. lupinaster* var. α *purpurascens* and var. β *albiflorum* in the Urals has shown them to be distinct in respect of the cenoses to which they pertain and although their areas occasionally overlap they form no intermediates. They differ also morphologically and are regarded as distinct races in the sense of Komarov [cf. 3514] and are given specific binomials, the former being regarded as *T. lupinaster* s. str. and the latter as *T. ciswolgense*. No apomixis was observed in either species but both proved self fertile. Cytological examinations showed that in *T. lupinaster* $2n = 32$ and in *T. ciswolgense* $2n = 16$. Forms of *T. lupinaster* from Japan and Korea, reported by Karpečenko to have $2n = 48$, are considered to belong to a different species again, *T. pacificum*. A central Russian form previously classed as *L. lupinaster* ssp. *angustifolium* but now regarded as a distinct species, *L. litwinowii*, also has $2n = 32$ but a pentaploid form with $2n = 40$ has been found in the Krasnojarsk territory and is being studied further.
A brief Latin diagnosis of *T. ciswolgense* is given.

4052 Weaver, N. & Weihing, R. M.
**Pollination of several clovers by honeybees.**
Agron. J. 1960 : **52** : 183–85.
With a view to obtaining information on seed production useful in breeding and strain evaluation, a study was made of the requirements of *Trifolium resupinatum, T. nigrescens, T. xerocephalum, T. michelianum* and *T. isthmocarpum* as regards honey-bee pollination. Bee behaviour and nectar yield were also investigated.

4053 Galan, C. & Popovici, D.
Producția de sămînță și fîn la cîteva populații de măzăriche de primăvară încercate la Stațiunea experimentală agricolă Suceava. (**The seed and hay production of some vetch populations investigated at the Suceava Agricultural Research Station**).
Stud. Cercet. ști., Biol. Ști. agric. Iași 1959 : **10** : 311–20.
Figures for seed production and green-matter yield are given for a series of introduced varieties and Rumanian populations studied during 1956–58. The vetches studied fell into two groups, a smaller semilate group with a vegetative period of 100 days, and a larger late group with a corresponding period of 105–115 days. For combined seed and green-matter production, the Rumanian populations from Băneasa and Suceava were best.

4054 Bhattacharyya, N. K.
**A comparative study on the cytology of a few species of two allied genera *Trigonella* and *Melilotus*.**
Caryologia 1958 : **11** : 165–80.
Mitosis and meiosis were examined in *T. foenum-graecum, M. alba* and *M. indica*. All three species had $2n = 16$, the chromosomes being mostly long to medium with median to submedian primary constrictions. Two pairs of chromosomes in *T. foenum-graecum* and three in the other two species bore secondary constrictions. Caryotypical similarities provided

evidence of a considerable degree of homology between the three species. At meiosis in *M. alba*, the bivalents showed secondary association, a minimum of three groups being noted. Bivalents in the other two species also tended to be secondarily associated, although less distinctly than in *M. alba*. This secondary association is suggestive of an allopolyploid origin for the three species.

4055 Smirnov, A. I.
**(The cultivation of sweet clover in Canada).**
Zemledelie (Agriculture) 1959 : No. 6 : 92–95. [Russian].

Mention is made of a recent US variety Cumino, which is recommended as a substitute for Arctic and Erector [cf. XXVIII, 4349–50]. Data on hay and seed yields of Arctic, Erector and four other Canadian varieties are given.

4056 Gladstones, J. S.
**Lupin cultivation and breeding.**
J. Aust. Inst. agric. Sci. 1960 : **26** : 19–25.

With reference to the literature, a survey is given of the production of lupin species in different countries and of their improvement by breeding.

4057 Palilov, A. I., Mušinskaja, L. G. & Demidova, G. F.
**(Crossing the lupin by pollinating unemasculated flowers).**
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1959 : No. 3 : 69–71. [Russian].

Experiments on pollination of unemasculated flowers of a lupin variety with the pollen of another variety differing from it in the colour of the leaves, stems and seed are described. The percentages of hybrid seed varied with the treatment, more hybrid seed being formed from pollination of maternal flowers before they had opened than from pollination 1–2 days after the flowers had started to shed their own pollen. The progeny of hybrids raised from unemasculated flowers was more productive of seed than the progeny of plants which had been emasculated.

4058 Kempanna, C. & Chandrasekhariah, S. R.
**A note on the cytology of some of the species of the genus *Crotalaria*, Linn.**
Mysore agric. J. 1960 : **35** : 9–12.

The following species had $n = 8$: *C. juncea*, *C. striata*, *C. brownii*, *C. mucronata*, *C. biflora*, *C. lanceolata*, *C. intermedia*, *C. goreensis*, *C. lanata*, *C. fulva*, *C. sericea*, *C. usaramoensis*, *C. anagyroides* and *C. retusa*; *C. incana* had $n = 7$. Pairing was normal in all species. Bridges observed in *C. sericea* and *C. usaramoensis* may have been fusion bridges.

4059 Makus, A.
Die Selbst- und Kreuzungsfertilität von Hornklee (*Lotus corniculatus* var. *vulg.* Koch) bei innerartlichen Kreuzungen.
[**Self and cross fertility of birdsfoot trefoil (*L. corniculatus* var. *vulgaris* Koch) in crosses within the species**].
Z. Pflanzenz. 1959 : **42** : 208–13.

Natural self fertilization was found to be very low but there was a marked increase in the number of seed set after artificial selfing. This species is cross fertile and particularly high seed sets were obtained using pollen mixtures containing pollen from *Melilotus*, *Trifolium* or *Medicago*. Pod and seed set depended on the length of time elapsing between emasculation and pollination. Honey bees and *Bombus proteus* are important pollinators.

4060 Laínz, M.
*Lotus uliginosus* Schkuhr (1804), ein unausrottbarer name? [***L. uliginosus* Schkuhr (1804), an ineradicable name ?**]
Bull. Jard. bot. Brux. 1960 : **30** : 35–36.

*L. pedunculatus* is said to be the correct name for the species commonly referred to as *L. uliginosus*.

## ROOTS AND TUBERS

4061 Krasočkin, V. T.
**(Review of the genus *Beta*).**
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1959 : **32** : No. 3 : 3–36. [Russian].

The wild species of the genus *Beta*, which is described, are found over a wide area, which is outlined. A table is given showing the various names that have been given to the species of *Beta*, with indications of synonyms. Thirteen species in all are recognized, *B. maritima*, *B. orientalis* and *B. cicla* being regarded as independent species, whereas *B. nana*, *B. macrocarpa* and *B. atriplicifolia* are not. The species of section *Vulgares*, comprising *B. maritima*, *B. patula*, *B. orientalis*, *B. cicla* and *B. vulgaris*, are regarded as standing closest to the type from which the genus has originated, this having been probably a maritime biennial. The

farthest from this are thought to be the species of section *Patellares*, comprising *B. procumbens*, *B. webbiana* and *B. patellaris*. The species *B. procumbens* shows the closest relationship to section *Vulgares*, particularly *B. patula*, and *B. macrorhiza* in section *Corollinae* also has relationships with section *Vulgares*. It is considered possible that *B. intermedia* may have arisen by hybridization between *B. trigyna* and *B. lomatogona*. The wild-growing forms of *B. orientalis* are regarded as escapes from cultivation and certainly not the progenitors of cultivated beet. Within *B. maritima* two subspecies, the Mediterranean and the Scandinavian, are distinguished, the former having several botanical varieties. *B. cicla* is divided into four subspecies according to geographical distribution, the oldest being thought to be ssp. *cretica* from Crete, Cyprus and the eastern Mediterranean. In *B. vulgaris* two subspecies, the Asiatic and the European, are distinguished, though even the latter is regarded as having originated in the near East, whence it was later brought to Europe. The latter subspecies is divided into three groups, mangels, table and sugar beets, seven botanical varieties being distinguished.
A key is provided for the identification of the species.

4062 Gusev, P. P.
**(Importance of winter and early spring sowings in breeding of biennial vegetable crops and fodder root crops in the far north).**
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1959 : **32** : No. 3 : 139–45. [Russian].
By sowing seed of beet, turnips and rape in the winter or in the early spring after vernalization the percentage of bolting was increased and by selecting the plants that did not bolt it was possible to produce lines with a longer vernalization stage. In cabbage, kale and carrots winter sowing improved yielding ability, an increase in yield of 19–25% being attained in carrots.

4063 Krasočkin, V. T.
**(Methods of speeding up breeding and seed production of beet).**
Trud. priklad. Bot. Genet. Selekc., Sborn. Puškinskih Lab. (Bull. appl. Bot. Gen. Pl.-Breed. Works of Puškin Lab.) 1958 : No. 1 : 253–56. [Russian].
Though flowering could be induced by vernalization of the seed, the amount of seed produced was small and this method therefore selected plants with a tendency towards bolting. Two varieties of mangel and two of table beet were sown in the greenhouse on 28 February and the seedlings were placed in a cold greenhouse on 20 March, where they remained until the beginning of May, when they were brought into the open and planted out at the end of May. In both the table beets, Flat Egyptian and Crosby, 100% seed production was obtained but in the mangels, Yellow Eckendorf and Barres, this was attained only if the seed had been vernalized.

4064 Dijkstra, N. D.
De verteerbaarheid en voederwaarde van polyploide bieten. (**The digestibility and feeding value of polyploid beets**).
Versl. landbouwkund. Onderzoek. 1960 : No. 66.3 : Pp. 23.
When the digestibility and composition of diploid and polyploid beets and beet tops were studied in feeding tests with wethers in the Netherlands, no difference in feeding value was found between polyploids and diploids. Two diploid mangels and two tetraploid sugar beets were used in 1957 and one diploid and two tetraploid sugar beets in 1958.

4065 Stoppelknollen 1960. (**Turnips, 1960**).
Landbouwvoorlichting 1960 : **17** : Bijl. No. 6; Ber. Rassenkeuze No. 286 : Pp. 6.
Data on the persistence of green coloration in the leaves, resistance to night frosts, tendency of soil to cling to the roots, resistance to the most prevalent strain of club root in the Netherlands and content and yield of dry matter are given for 17 early or midseason varieties and 18 late or midseason varieties tested in the Netherlands.

4066 Lamb, K. P.
**Field trial of eight varieties of *Brassica* field crops in the Auckland district.**
NZ J. Agric. Res. 1960 : **3** : 320–31.
A trial was carried out on the swedes Calder, Superlative, Wye and Doon Spartan, the turnips Green Globe and York Globe, the rape Broad-leaf Essex and marrow-stem kale. Doon Spartan and Calder were resistant to *Brevicoryne brassicae*, highly resistant to *Myzus persicae* and turnip mosaic and moderately resistant to cauliflower mosaic. Doon Spartan was also outstanding for winter survival and yield. The turnip varieties were highly resistant to both aphids.

4067 Błaszczak, W.
Badania morfologiczne-fizjologiczne 9 szczepów *Rhizoctonia solani* Kuehn z brukwi. **(Morphological and physiological studies of nine strains of *Rh. solani* Kuehn from swede).**
Poznań. Towarz. Przyjaciół Nauk Wydział mat.-pryrod. Prace Kom. Nauk roln. Leśn. 1959 : **5** : No. 8 : Pp. 28.
Differences in growth rate, in structure, colour and arrangement of the sclerotia, in response to culture in the dark and in pathogenecity on swede and rape were found among nine Polish isolates of *Rh. solani* (*Pellicularia filamentosa*) from swede. Rb20, Rb21a and Rb22 were highly pathogenic on both crops, while a strain from potato, Rs22, showed no pathogenicity on either.

4068 **Results of potato variety trials.**
Leafl. Minist. Agric. N. Ire. 1960 : No. 7 : Pp. 14.
A report is provided on yield trials carried out on recently introduced and established varieties at the farm of Greenmount Agricultural and Horticultural College, Muckamore, Co. Antrim, N. Ireland.

4069 Evdokimov, M. M. & Komkova, M. V.
**(Varietal testing and seed production to keep up with the new tasks).**
Kartofel' (Potato), Moskva 1959 : No. 4 : 39–41. [Russian].
Methods intended to improve potato testing and seed production procedures are discussed and an account of the 1958 state varietal trials, together with descriptions of the following new Soviet cultivars, is given. Detskoe Selo [Early Rose x $F_2$ (*Solanum demissum* x *S. andigenum*)] was bred at the Institute of Plant Industry, Vilija (Wohltmann x Pepo) originated from the Lithuanian Institute of Agriculture and Kemerovo [(Centifolia x Jubel) x *S. andigenum*] and Stendskij Belyji [Stende White] (Vale x Hindenburg) from Kemerovo and Stende respectively. All four are midseason types with high yields of top grade tubers rich in starch. Detskoe Selo is resistant to *Phytophthora*. Slow introduction of new varieties including wart-resistant cultivars bred in Lithuania is criticized.

4070 Løvø, P. J.
Forsøk med potetsorter. **(Trials of potato varieties).**
Forskn. Fors. Landbr. 1960 : **11** : 255–76.
On the basis of trials of yield, quality and tuber size conducted in Norway over the period 1942–56, the following varieties are recommended: Jøssing, Parnassia, Dianella and DS x Ås 1006 for industrial use and fodder; Ås and, at higher altitudes, King George V for fodder; and Kerrs Pink for table use. Saga and LB x RJ305 show promise as table varieties, but their attractiveness to consumers has yet to be ascertained.

4071 Bretan, C.
Linii noi de cartof de perspectivă pentru Transilvania. **(New promising lines of potato for Transylvania).**
Probl. Agric., Bucureşti 1959 : **11** : No. 10 : p. 105. (Abst.).
Mention is made of recently bred lines exhibiting such characters as high productivity, early tuber formation and rapid accumulation of reserve materials in the tuber.

4072 Grădinaru, N. & Gaşpăr, I.
Linii şi soiuri de cartof experimentate la Staţiunea experimentală agricolă Suceava. **(Lines and varieties of potato tested at the Suceava Agricultural Experimental Station).**
Stud. Cercet. şti., Biol. Şti. agric. Iaşi 1959 : **10** : 127–33.
Trials of some recently bred lines in 1956–58 are reported, data being given on yield, disease resistance and starch and protein content. Cluj 50–22, Cluj 50–18 and Magurele 59–53 were most promising.

4073 Murphy, H. J., Goven, M. J., Schark, A. E. & Blood, P. T.
**Maine potato variety trials for 1959.**
Misc. Publ. Me. agric. Exp. Sta. 1959 : No. 638 : Pp. 30.
A report is presented of trials on old and new commercial varieties and unnamed seedlings with respect to growth characteristics, disease resistance, yield, dry-matter content and suitability for crisp and chip making.

4074 Matsubayashi, M. & Mori, T.
**Studies on the species differentiation in the section Tuberarium of *Solanum*. VII. Morphological analysis of the tetra- and the pentaploid $F_1$ hybrids from *S. demissum* x *S. chacoense*.**
Hyogo Noka DaigakuKenkyu Hokoku : Nogaku Hen/Sci. Rep. Hyogo Univ. Agric. : Ser. Agric. 1959 : **4** : 65–69.
Tetraploid and $5x$ $F_1$ hybrids from *S. demissum* ($2n = 72$) ♀ x *S. chacoense* ($2n = 24$) ♂ were examined with respect to morphology and

growth rate. The 5*x* hybrids bore a much closer resemblance to *S. chacoense* than the 4*x*, probably because they contained 24 chromosomes from this parent as the result of the functioning of unreduced ♂ gametes. [cf. 2851].

4075 Heiken, A.
**Spontaneous and X-ray-induced somatic aberrations in *Solanum tuberosum* L.**
Acta Acad. reg. Sci. upsal. 1960 : No. 7 : Pp. 125.

Tuber halves of Ackersegen, Bintje, President, Ulster Chieftain and Up-to-Date were X irradiated (500–8000 r.) in three series of experiments, treatments being applied at the dormant stage of the tubers, at the beginning of germination and after germination. Intervarietal differences in sensitivity to radiation, as shown by retardation of sprouting and lethal effect, were noted. Irradiation during the dormant period caused most injury. In series I of the experiments, only 8·3% of the somatic aberrants recorded in the $X_2$ and $X_3$ vegetative generations originated from plants showing observable deviations in the $X_1$ vegetative generation. Induced aberrants could not therefore be isolated with any degree of certainty from the $X_1$. Spontaneous aberrants found during 1953–59 are classified and described in a survey which includes a detailed review of the literature on spontaneous somatic aberrants in the potato. Most of the somatic changes observed have been characterized by marked pleiotropic effects. Different bolter types were distinguished within Bintje, Eigenheimer and Up-to-Date, representing in each variety different degrees of expression of the many characters in which bolters deviate from normal plants. All types isolated persisted when vegetatively propagated, although certain chlorophyll and leaf-deformity types were highly unstable. Two aberrations, the bolter condition and blistered leaf, were found in combination. Some induced aberrants were identical with spontaneous ones isolated during the investigation, while others had no spontaneous counterparts. Most of the variants in the latter group have however been previously described in the literature. The frequencies of the spontaneous occurrence of ten aberrant types were determined. The upper 0·99 confidence limit of the rate of frequency of the bolter type was $1{\cdot}8 \times 10^{-3}$ in Bintje and $1{\cdot}5 \times 10^{-3}$ in Eigenheimer. For the other types, it ranged from $1{\cdot}2 \times 10^{-5}$ (convolvulus leaf and spinach leaf) in Bintje to $8{\cdot}4 \times 10^{-5}$ (spinach leaf in Up-to-Date). The highest frequency of induced aberration (calculated on the basis of the number of the families containing at least one aberrant plant) was 37%, obtained from the combined results of treating President with 4000 and 8000 r. Intervarietal disparities in mutability were detected, while the stage of treatment associated with the highest mutability appeared to be the initial stage of germination. Tests were carried out to confirm that the changes in morphological and physiological features were not caused by virus infection. By means of eye-excision experiments, the following aberrant types were shown to be periclinal chimeras: blistered leaf, white flower and yellow leaf in President, convolvulus leaf (Bintje), glazed leaf (King Edward VII and Up-to-Date) and light green leaf (British Queen, Craigs Defiance and King Edward VII). The dwarf, feathery-wilding, spinach-leaf and wilding types were not periclinal in structure; neither did they depart from the normal chromosome number. The bolter, wilding, glazed leaf and light-green leaf types had a prolongation of the dormant period, of respectively 22, 8, 7 and 6 days. Feather wilding, on the other hand, was characterized by a reduction of 12 days in this period. Aberrants were studied with respect to their agricultural value. While the extreme types were worthless on account of drastic reductions in yield, bolters were of interest, particularly those isolated from Bintje, several of which outyielded the normal variety during the two years of testing under very different weather conditions. Finally, the results are discussed from the point of view of their significance for breeding.

4076 Bočev, V. V.
**(Interspecific vegetative hybridization of potatoes).**
Agrobiologija (Agrobiology) 1959 : No. 3 : 410–15. [Russian].

Bulgarian experiments on vegetative hybridization involving *Solanum demissum* and Lorh are described. The hybrid Lorh/ $V_1$ (Lorh/*S. demissum*) developed aerial tubers and showed proliferations of inflorescences. $V_1$ progenies of the hybrid were raised from normal tubers, aerial tubers and the seed from selfing of normal and secondary inflorescences. The progeny from aerial tubers was superior to all others. It was vigorous, resistant to diseases and most productive of tubers including large ones. The tubers were richer in dry matter, starch and sugar than Lorh.

4077 Ponamarenko, P. V. & Masjura, P. D.
**(The sowing of potatoes in summer in the Kirovograd province).**
Agrobiologija (Agrobiology) 1959 : No. 3 : 448–50. [Russian].
The midseason varieties Courier and Polessk showed improved tuber yields and reduction in the number of degenerate plants after late sowing for two successive generations.

4078 Dearborn, C. H.
**Alaska 114, a tough-skinned main crop potato.**
Amer. Potato J. 1960 : **37** : 108–10.
Alaska 114, developed from Cobbler x Minnesota 13–1 [Russet Burbank x 66–1 (Katahdin selfed)], produces tubers uniform in size and shape, with tough skin, good culinary qualities and less after-cooking darkening than Green Mountain. The variety is not subject to storage rots, sprouting in storage or development of sprout tubers when planted in cold soils. Its reaction to late blight is not yet known.

4079 Fiedler, H. & Schreiter, J.
Das Pachytän-Genom von *Solanum vernei*. **(The pachytene genome of *S. vernei*).**
Z. VererbLehre 1959 : **90** : 62–65.
Morphological details of pachytene chromosomes are given; the descriptions do not correspond to those of Gottschalk and Peters [cf. XXV, 1561].

4080 Rakitin, Ju. V., Krylov, A. V., Gejden, T. M. & Garaeva, K. G.
**(Delaying the germination of tubers in different potato varieties during long storage).**
Fiz. Rasten. (Phys. Pl.) 1959 : **6** : 501–03. [Russian].
The tubers of 189 varieties stored better after dusting with M1, a preparation of methyl ether α-naphthyl acetate, in experiments conducted in Moscow. There were considerable varietal differences in response to the treatment.

4081 Veselovskij, I. A.
**(Breeding early potato varieties).**
Vestn. sel'skohozjajstv. Nauk (Rep. agric. Sci.) 1959 : No. 6 : 133–35. [Russian].
The breeding of cultivars which combine earliness with resistance to diseases, high quality of tuber and other economically valuable characters at the Leningrad Agricultural Institute is discussed. The methods comprise intervarietal hybridization between domestic varieties, especially between early x midseason cultivars, interspecific hybridization, back crossing and the production of synthetic hybrids. Brief descriptions are given of Murmansk [Epicure x (Epicure x Cobbler)], Epron (Epicure x Alma) and Imandra (Jubel x *Solanum andigenum* f. *tocanum*), all of which have been in cultivation for many years, also Hybrid 2–4, from [(*S. demissum* x Pepo) x Katahdin] x Rosafolia. This last hybrid is early, resists *Phytophthora* and wart and has high-quality tubers which are rich in protein and vitamin C and have good keeping properties. Valuable heritable properties of *S. andigenum* include high yield of tubers rich in protein and starch and resistance to *Synchytrium*, while *S. demissum* is interesting for its resistance to frost and *Phytophthora*. The wart resistance of early varieties such as Imandra or Priekuļi has been improved by crossing them with Cobbler, Jubel, Pepo, Majestic, Rosafolia or Berlichingen. To transmit *Phytophthora* resistance to the hybrids thus obtained they are crossed with *S. demissum* and then back crossed to *S. tuberosum;* crossing them with such varieties as Aquila or Ballydoon improves their resistance to viruses. The cultivars Pepo, Rosafolia, Jubel, Early Rose and Majestic are recommended as components in crosses where it is intended to improve tuber shape and *S. rybinii*, *S. boyancense* and *S. kesselbrenneri* are thought to be valuable for breeding early varieties having a short or no dormant period.

4082 Močalova, T. I.
**(The frost resistance of the potato and its dependence on biochemical and physiological properties).**
Vestn. sel'skohozjajstv. Nauk (Rep. agric. Sci.) 1959 : No. 6 : 135–38. [Russian].
Experiments at the Leningrad Agricultural Institute showed that the winter-hardy polyploid form of *Solanum punae* ($2n = 96$) had a higher sugar content in the leaves than domestic varieties at temperatures below zero. The polyploid was also distinguished from the cultivars by a greater photosynthetic activity and a higher respiration rate. $F_1$ hybrids of the polyploid with Kameraz 1 resembled *S. punae* in all the above respects more closely than Kameraz 1, while the back crosses to Kameraz 1 shifted towards the cultivar in respect of their biochemical and physiological properties. The experiments suggest that the polyploid can be utilized in breeding potatoes for frost resistance.

4083 Gottschling, W.
Auswertung achtjähriger Feldprüfungen auf Resistenz gegen den Kartoffelschorf. **(An evaluation of eight-year field tests of resistance to potato scab).**
NachrBl. dtsch. PflSchDienst., Berlin 1959 : **13** : 210–16.

Of the 29 varieties tested in Neu-Vehlefanz, Ackersegen was the most resistant; 11 other varieties were slightly resistant and the rest susceptible. The amount of infection varied from year to year according to weather conditions and therefore a four-year test is considered necessary for obtaining reliable estimates of the resistance of new strains. By staggering planting times between mid-April and the end of May, varieties of all maturity periods may be grown during weather conditions favouring the development of the disease.

4084 Lapwood, D. H.
**Recent developments in breeding for the control of potato blight.**
NAAS quart. Rev. 1960 : No. 47 : 93–98.

With particular reference to potato production in Great Britain, the problems and value of breeding for immunity from *Phytophthora infestans* through hypersensitivity and multigenic field resistance are considered.

4085 Storoženko, Ju. G.
**(The *Phytophthora* resistance of potato varieties different in respect of immunity under the conditions of Sahalin).**
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1959 : No. 4 : 132–35. [Russian].

Several resistant varieties introduced from the Institute of Plant Industry and the Potato Institute in Moscow exceeded the local varieties in tuber yields and resistance to *Phytophthora* in trials in Sahalin. However, even the best of the introductions, such as Ural, Krasnoufimsk and seedling 7–585, had a high degree of infection in some years.

4086 Niederhauser, J. S., Fernández, J., Cervantes, J., Pérez, G. & Delgado, S.
Tres nuevas variedades de papa resistentes al tizón tardío. **(Three new potato varieties resistant to late blight).**
Agric. téc. Méx. 1959–1960 : No. 9 : 28–30.

[Cf. 519].

4087 Van der Zaag, D. E.
**Some observations on breeding for resistance to *Phytophthora infestans*.**
Europ. Potato J. 1959 : **2** : No. 4 : 278–86.

Field resistance is dependent on three main circumstances: (1) the chance of a spore penetrating a leaf; (2) the rate at which the mycelium spreads within the leaf tissue; and (3) the rate at which sporangia are formed and the number of sporangia formed per unit leaf area. Details are given of techniques used in determining these factors and the results obtained from comparing the resistance of four varieties are reported. These factors varied in importance in the individual varieties.

4088 Hrobryh, N. D.
**(Skin spot on potato varieties and species).**
Trud. priklad. Bot. Genet. Selekc., Sborn. Puškinskih Lab. (Bull. appl. Bot. Gen. Pl.-Breed. Works of Puškin Lab.) 1958 : No. 1 : 231–41. [Russian].

The symptoms of the skin spot caused by *Oospora pustulans* on various potato species and varieties in the north of the Soviet Union are described. Certain domestic varieties mentioned as being highly resistant include a hybrid of *Solanum andigenum* x *S. tuberosum* 1/122. Resistant wild species included *S. jamesii* and *S. ballsii* and a seedling of *S. gibberulosum.*

4089 Braun, H.
Rassenbildung des Kartoffelkrebses (*Synchytrium endobioticum*). **[Race formation of potato scab (*S. endobioticum*)].**
Kartoffelbau 1959 : **10** : 234–37.

[Cf. 1718].

4090 Huijsman, C. A.
**Nature and inheritance of the resistance to the potato root-eelworm, *Heterodera rostochiensis* W. in *Solanum kurtzianum*.**
Meded. LandbHoogesch. Gent 1959 : **24** : 611–14.

Seedlings of the diploid *S. kurtzianum* have proved resistant both to the ordinary eelworm race A and to several local Netherlands strains of race B, which attacks race-A-resistant progenies of *S. andigenum* 'CPC 1673'. The resistance of *S. kurtzianum* appears to be of the same nature as that of *S. andigenum*, a hatching factor being produced in the resistant plants with occasional cysts formed through reinfection. The results of crosses of *S. kurtzianum* with the susceptible diploids *S. stenotomum*

and *S. goniocalyx* suggested that resistance is determined by two dominant polymeric genes.

4091 Eibner, R.
Untersuchungen über die "Eisenfleckigkeit" der Kartoffel. (**Investigations on internal rust spot of potato**).
Diss. Landw. Fak. Univ. Giessen 1959 : Pp. 111.

Internal rust spot (sprain) comprises two distinct disorders. Infection with rattle virus leads to the formation of variously shaped necroses in the tubers of susceptible plants. Necrotic spots inside the ring of vascular bundles in the tuber are the result of a physiological disorder connected with soil conditions. Of the 76 German varieties tested, 32 showed no symptoms of the virus disease in infected soil but only Susanna showed resistance to the physiological disorder.

4092 Benson, A. P. & Hooker, W. J.
**Isolation of virus X from "immune" varieties of potato, *Solanum tuberosum*.**
Phytopathology 1960 : **50** : 231–34.

Virus X was found to be present in low concentrations in the USDA seedling S41956 and in Saco and Tawa. The virus was isolated most frequently from S41956 and least from Tawa, suggesting degrees of resistance among these varieties. In no case was the virus isolated from leaf tissues.

4093 Nazarenko, B. P.
(**Determining the starch content of tubers in breeding work**).
Kartofel' (Potato), Moskva 1959 : No. 4 : 61–63. [Russian].

A quick method for calculating the starch content of a potato tuber, together with a specially designed balance for weighing tubers in the air and submerged in water, is described. The starch content (K) is obtained by using the simple formula $K = 252{\cdot}4 \frac{v}{V} - 5{\cdot}56$, $v$ representing the weight of tuber submerged in water and $V$ its aerial weight.

4094 Krishna Sastry, K. S.
**Observations on flowering, seed-setting and seedling selection in sweet-potato *Ipomoea batatas* Poir.**
Mysore agric. J. 1959 : **34** : 132–38.

Studied at the Agricultural Research Station, Hebbal, near Bangalore, local varieties collected from Mysore State differed in amount of flowering and seed setting and in the duration and time of commencement of flowering. All varieties were self sterile. Of the open-pollinated seedlings selected, five were chosen for yield trials. In addition to their productivity and other desirable characters, these five selections possess some resistance to weevil (*Cylas formicarius*).

4095 Alvarez L., E., Cásseres, E. H. & Hernández B., G.
Dos nuevas variedades de camote de alta calidad. (**Two new sweet-potato varieties of high quality**).
Agric. téc. Méx. 1959–1960 : No. 9 : 51–52.

The two new Mexican varieties Catemaco and Cuitzeo have been developed from Californian material, the first from B5999 x (B6026 x BPI 153655) and the second from [(Tinian x B6026) x B5999] x [(Okla.29 x B5999) x (15–S–6 x B599)]. They have bright orange flesh, contain 600 times more carotene than local white-fleshed varieties and have a high sugar content, good flavour and fine texture. Both are productive, Cuitzeo giving good yields of uniform, elliptical tubers, particularly in the Bajío, while Catemaco, which gives uniform, cylindrical roots, is adapted to Veracruz.

4096 Faan [Fan], H.-C., Chou, L.-K. & Leung [Liang], H.-M.
(**Report on field control of a sweet-potato disease in Kwangtung**).
Chih-wu Ping-li-hsueh Pao (J. Pl. Path.)/ Acta phytopath. sin. 1959 : **5** : 79–88. [Chinese].

Varieties grown in the above province were found to vary in their degree of susceptibility to a serious local bacterial wilt. The variety Tai-nung 46 [Taiwan Agriculture 46] is highly resistant.

## FIBRES

4097 Garber, K.
Gustav Bredemann zum 80. Geburtstag. (**Gustav Bredemann on his 80th birthday**).
Landw. Forsch. 1960 : **13** : 91–92.

Mention is made of Bredemann's achievements in breeding fibre plants.

4098 Saad, S. I.
**The sporoderm stratification in the Malvaceae.**
Pollen et Spores 1960 : **2** : 13–41.

Study of 35 species representing 17 genera

showed that morphological characters of the pollen of genera and species were sufficiently well-defined to serve as a basis of identification of these taxa. In general, pollen diameter and chromosome number were related, as was particularly evident in *Hibiscus* and *Gossypium*. Some discussion of the relationship between pollen morphology, chromosome number and taxonomy is given.

4099 **Cotton breeding scheme, Bahawalpur.**
Pakist. Cott. 1960 : **4** : No. 3 : 217–22.
The results of trials of varieties and selections of American and Asiatic cotton in the above region, W. Pakistan, are reviewed.

4100 **The scheme for improvement of cotton in Jhang district.**
Pakist. Cott. 1960 : **4** : No. 3 : 240–43.
An account is given of tests on selections of commercial varieties and of crosses between local types, undertaken in the scheme for developing cotton better than 4F (*Gossypium hirsutum*) for the Jhang District, W. Pakistan.

4101 **Scheme for the improvement of cotton in Upper Thal, Quaidabad.**
Pakist. Cott. 1960 : **4** : No. 3 : 248–50.
The results from trials of varieties of American and Asiatic cotton, reselections of LSS (American) and derivatives of crosses between American types at the Quaidabad station, W. Pakistan, are summarized.

4102 Ul'džabaev, T., Rodičev, S. & Firsov, B.
**(Our impressions of cotton production in the USA).**
Hlopkovodstvo (Cotton Growing) 1959 : No. 5 : 56–60. [Russian].
This report on a scientific tour mentions some American achievements in breeding new varieties, in particular varieties with increased yields, high ginning percentage, improved technological properties, resistance to wind and *Fusarium* wilt, and suitability for mechanical harvesting. Several varieties are recommended for introduction trials in the USSR.

4103 Calzada B., J. & Caballero A., W.
Selecciones de algodón para los valles de la Costa Central. **(Cotton selections for the valleys of the Costa Central).**
Inform. Div. Exp. agríc., Lima 1960 : No. 66 : Pp. 42. (Mimeographed).
On the basis of tests held in the central coastal area of Peru during 1956–57 and 1957–58, data on yield, fibre percentage, fibre length and boll weight are given for the 34 varieties previously tested [cf. XXIX, 4114] and six additional varieties. The five best in the central subzone were Cñ 281–51, Cñ 276–51, LM1041–49, Cñ 442–48 and LMWI–52 and in the southern subzone LMWI–52, SNA15WT, LMW395–42, LM708–44 and ICA576–52.

4104 Rhyne, C. L.
**Leaf location in *Gossypium* amphidiploids as determined by leaf-shape genes of *Gossypium* diploid species.**
Genetics 1960 : **45** : 63–78.
"A transference of leaf-shape genes was made from the A and D Gossypium diploid species to the A and D genomes of natural Gossypium amphidiploids. The dominant genes from the A diploids gave duplicate factor inheritance with the dominant alleles of the amphidiploid occurring at the leaf-shape locus. The dominant genes of the D diploids exhibited allelism with the four alleles of the amphidiploid leaf-shape locus. The independence of the A diploid genes and the allelism of the D diploid genes collectively support a placement of the amphidiploid leaf-shape locus on the D genomes. The gene from *G. thurberi* $2D_1$ was commonly transferred to the D genomes of amphidiploids and infrequently to the A genomes. The transposition of this D diploid gene to each of the amphidiploid genomes perhaps illustrates a similar earlier transposition of an A genome gene during the settling down of a newly produced amphidiploid. The "thurberi" gene for leaf shape was shown to be similar to the Sea Island gene commonly found in *G. barbadense*. The entire leaf-shape gene from two different D diploids was similar and perhaps identical with the gene now present in the D genomes of broad-leaf *G. hirsutum* 2(A*h*D*h*).
"A production of a common phenotype was possible from more than one combination of genes of the A and D diploids in amphidiploid background. Such diversification in gene action by the genes at each of the two amphidiploid loci was unexpected for the Gossypium amphidiploids, which sometimes have been assumed to be of recent and common origin. Rather this ability to produce a common phenotype with different genes of each genome of an amphidiploid suggests that Gossypium amphidiploids are evolutionary old species. Alternatively, the amphidiploids may not be old species but may have multiple origins at least of the D genomes. The gene interaction of the leaf-shape genes of each locus of amphidiploid *G.*

*hirsutum* produced phenotypes that resembled models for epistatic gene action in quantitative inheritance studies. Neither the duplicate model nor the additive gene action model had a good fit to the observed interaction of leaf-shape genes in the amphidiploid."

[Author's summary].

4105 Lewis, C. F. & Richmond, T. R.
**The genetics of flowering response in cotton. II. Inheritance of flowering response in a *Gossypium barbadense* cross.**
Genetics 1960 : **45** : 79–85.

Inheritance of flowering behaviour was studied in a cross between *G. barbadense* 'Lengupa' from Colombia and 'Pima S–1', respectively short-day and day-neutral. Under natural long-day conditions of summer growth at College Station, Tex., flowering response depended on a single pair of genes (*Ff*), with the short-day nonflowering reaction dominant to flowering. [Cf. XXVIII, 1890].

4106 Ganga Prasada Rao, N.
**A note on the performance of some *hirsutum-barbadense* hybrids under the Tungabhadra project.**
Osmania Agric. 1959–60 : **7** : 21–24.

A report is given on preliminary tests of $F_1$ hybrids between (1) seven Upland cottons and Giza 7 and Giza 12 and (2) Co. 2 x Sea Island, with Laxmi as control, at the Tungabhadra Agricultural Research Station, Dhadesugar, Andra Pradesh. Hybrids involving the Giza varieties were more vigorous and better in yield than Co. 2 x Sea Island, Gadag 1 x Giza 7 and MA2 x Giza 12 giving the highest yields. Co. 2 x Sea Island was however superior in fibre properties and was not much below Laxmi in productivity.

4107 Kammacher, P.
Sur les affinités caryologiques entre les espèces cultivées de cotonniers tétraploïdes et l'espèce sauvage diploïde *Gossypium raimondii*. (**On the caryological affinities between the cultivated tetraploid cotton species and the wild diploid species *G. raimondii*).**
CR Acad. Sci., Paris 1960 : **250** : 2745–47.

A study of meiosis in the hybrids *G. hirsutum* x *G. raimondii* and *G. barbadense* x *G. raimondii* showed that the genome of *G. raimondii* pairs almost completely with half of the genome (genome D) in each of the tetraploids. Few anomalies of division were seen, but there was evidence of a reciprocal translocation between a chromosome of *G. hirsutum* and one of *G. raimondii*. In the rather greater frequency of ADD trivalents and the disturbance in behaviour of the A univalents in *G. hirsutum* x *G. raimondii*, *G. hirsutum* shows a lower level of "diploidization" than *G. barbadense*. For this reason, Mauer's view that the two species arose independently is regarded as more probable than Hutchinson's suggestion that *G. barbadense* has given rise through differentiation to *G. hirsutum*.

4108 Glavinič [Glavinić], R.
**(The efficacy of the Mičurin method of employing pollen mixtures in cotton hybridization).**
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1959 : No. 5 : 92–96. [Russian].

An account of experiments on interspecific hybridization between *Gossypium barbadense* and *G. hirsutum* varieties carried out in recent years in Jugoslavia is given. No promising hybrids were obtained by ordinary interspecific crossing, whereas several hybrids obtained by the use of pollen mixtures were more vigorous and productive than their parents. Several promising new strains were selected, in particular from hybrids obtained by fertilization of *G. barbadense* 'Karnak' and 'Zagara' by the pollen mixture *G. hirsutum* '182' + '78' + '1306' + '21hv' + maternal pollen.

4109 Ter-Avanesjan, D. V. & Anciferov, N. G.
**(Application of foreign pollen in cotton hybridization).**
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1958 : **31** : No. 3 : 143–50. [Russian].

In series (1) of the experiment, 20 pollen grains of the maternal variety were applied to emasculated flowers and after 3 hr. a large quantity of pollen of another species or genus was applied. In series (2) a mixture of equal proportions of maternal and foreign pollen was applied and in series (3) a large quantity of pollen of the pollen parent on two successive days, followed by a mixture of equal amounts of pollen from the maternal and paternal parents applied 2–3 hr. later. All buds other than those pollinated were removed; in control plants similar pollinations were made without removing the other buds. The maternal parent in each case was a member of *Gossypium hirsutum* and pollen from *G.*

*herbaceum, G. arboreum, Hibiscus coccineus, H. cannabinus, H. esculentus* and *Althaea rosea* was used.
Seed sets from all three treatments were higher when the other buds were removed than in the control plants where they were left on. In treatment (1) a hybrid of *G. hirsutum* x *G. herbaceum* was produced but it proved sterile. From pollination with *H. coccineus* a plant was obtained which deviated from *G. hirsutum* in many features of the plant and lint, showing clear resemblances to *H. coccineus*. Plants deviating from the maternal type were obtained also in pollinations of *G. hirsutum* x *G. herbaceum*, some of them showing improvements of 4·8 mm. in lint length and 0·8 g. in boll weight; others were 12–18 days earlier. In all cases the deviations were transmitted to the next seed generation.

4110 Vysockij, K. A.
**(Cotton-mallow and cotton-*Hibiscus* hybrids).**
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1958 : **31** : No. 3 : 151–69. [Russian].
In 1939 a sterile hybrid, intermediate in morphology, was obtained between *Gossypium hirsutum* and *Althaea rosea* but attempts to repeat the cross by conventional methods proved unsuccessful. However, by various methods, such as removal of unpollinated flower buds, application of portions of the stigma of the pollen parent together with the pollen, and pollination with maternal pollen a few hours after the application of the foreign pollen, a number of hybrids of *G. hirsutum* with *Malva* spp., *A. rosea* and *H. cannabinus, H. esculentus, H. moscheutos, H. coccineus, H. militaris* and *H. syriacus* have been produced. By back crossing with cotton, $F_2$ and later generations were obtained. Many of them closely resemble *G. hirsutum* but present certain characters of the other parent, including valuable features such as earliness, capacity to germinate at 13–14° C., lint length of 36–38, tensile strength of 5·2 g., bolls weighing up to 11–12 g., and resistance to spider mites, gummosis and wilt.

4111 Khanna, R. C.
**An experimental study in quantitative inheritance of cotton.**
Statist. News Lett. 1959 : **9** : No. 3 : p. 19. (Abst.).
Crosses between 11 superior and 9 inferior Bengal strains were selected for high and low fibre length from the $F_3$ onwards at the Institute of Plant Industry, Indore. "The heterosis as well as the relative efficiency of the different strains for crossing have been studied. The genetic variability present in the material was estimated and it has been shown that for crosses with relatively low coefficient of variation, as in the present case, attention should be concentrated on mean values for making further selection. A method of estimating the number of factors in material where selection is practised in two directions, has also been presented."

4112 Walker, J. T.
**The use of a selection index technique in the analysis of progeny row data.**
Emp. Cott. Gr. Rev. 1960 : **37** : 81–103.
"An account is given of the selection index technique that has been used with a replicated progeny row system at Namulonge for ten seasons. The technique facilitates interprogeny selection and is responsible for the considerable yield improvement effected in BP52 cotton since 1948.
"The computations necessary to derive an index based upon 'bolling index,' 'seeds per boll' and 'lint per seed' are fully described.
"Results gained by using indices incorporating yield are reported, and it is concluded that the most convenient index is that which utilizes yield, 'seeds per boll' and 'lint per seed'.
"The calculation of selection advance is described, and the importance of considering inter-trait correlations is emphasized.
"Finally, some points dealing with the suitability of material for subjection to such a selection technique are discussed. The need for homogeneity of yield determination is stressed." [Author's summary].

4113 Abdul Hameed Khan
**362F, a new medium staple variety of cotton for Upper Thal.**
Pakist. Cott. 1960 : **4** : No. 2 : p. 151.
Released for the above region in West Pakistan, 362F has a staple length of 0·93 in. and spinning performance of 30–40s. It has shown superiority in yield over older varieties under the conditions of very high temperature, hot dry winds and hard red clay soils impregnated with salts, prevailing in the area. It matures earlier than LSS and is resistant to *Empoasca devastans*.

4114 Abdul Hameed Khan
**231R, a new short staple variety of Desi cotton.**
Pakist. Cott. 1960 : **4** : No. 2 : p. 152.
The early-maturing and highly productive Asiatic cotton 231R has been released as a

substitute for 39 Mollisoni in the Multan, Lahore and Rawalpindi Divisions, West Pakistan. It has a staple length of 0·52 in. and ginning outturn of 40·8% and is suitable for spinning 6s.

4115 Nicholson, G. E.
**The production, history, uses and relationships of cotton (*Gossypium* spp.) in Ethiopia.**
Econ. Bot. 1960 : **14** : 3–36.

With extensive reference to the literature, the above aspects are surveyed and discussed [cf. XXVIII, 4458]. It is suggested that cultivated varieties of *G. arboreum* may have become first differentiated in Asia directly following the introduction of an ancestral cultivated diploid African type which had its origin in Ethiopia. The magnitude of the differences between *G. arboreum* race *soudanense* and *G. herbaceum*, as compared with those within *G. herbaceum*, are such that this suggestion seems more plausible than the hypothesis of the evolution of race *soudanense* from *G. herbaceum* var. *acerifolium*. *G. herbaceum* vars. *africanum* and *acerifolium* may be regarded as the separate descendants of the ancestral cultivated stock, from which they arose through geographical differentiation and human selection. It may be supposed that the ancestral stock once bridged the territorial gap now existing in the distribution of the two varieties in Africa and may have also been extensively grown in the northern and eastern parts of Africa, and possibly also in Asia. The possibility of the occurrence of such a stock in territories linking East Africa with Arabia, Iran, Baluchistan and India eliminates the need to postulate a northern transfer of wild *G. herbaceum* var. *africanum* by traders at a date sufficiently early, before 3000 BC, to allow for the development, directly from the wild condition, of cultivated types of *G. herbaceum* and, later, of *G. arboreum* [cf. XXV, 401]. It is stressed that, although these suggestions may be regarded as only tentative, Ethiopia demands much greater attention than it has hitherto received in attempts to elucidate the origin and relationships of *Gossypium* spp.

4116 Bose, S.
**Cytogenetical investigations in cotton, with special reference to chromosome morphology of five types belonging to *Gossypium arboreum* L.**
Trans. Bose Res. Inst. 1953–55 : **19** : 67–71.

A caryotypic analysis of four varieties of *G. arboreum* race *indicum* and one of *G. arboreum* var. *typicum* has been made. Satellites and secondary and supernumerary constrictions are fairly frequent.

4117 Saunders, J. H.
**The wild species of *Gossypium*. III. The D genome.**
Emp. Cott. Gr. Rev. 1960 : **37** : 182-87.

Literature on the genetics and cytology of species having genome D is discussed with regard to the possible interrelationships within this genome and the question of which species is most closely related to the ancestral D diploid involved in the evolution of amphidiploid cottons. [Cf. XXIX, 4115 and XXX, 561]. Taxonomic descriptions are given of the taxa discussed, viz. *G. thurberi*, *G. armourianum*, *G. harknessii*, *G. klotzschianum*, *G. klotzschianum* var. *davidsonii*, *G. aridum*, *G. raimondii*, *G. gossypioides* and *G. lobatum*.

4118 Liu, C.-I.
**(A report on studies of shedding of cotton buds and bolls in cotton areas which had been subjected to high summer temperatures for two years).**
Nung-yeh-hsueh Pao (J. Agric.)/Act. agric. sin. 1959 : **10** : 537–57. [Chinese].

Figures are provided of the degree of flower-bud and boll shedding in a series of introduced and local varieties of Upland and Sea Island cotton grown under the above conditions in China in 1956–57.

4119 Jaroš, N. P.
**(Intraspecific and interspecific variation in the chemical composition of cotton seeds).**
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1958 : **31** : No. 3 : 170–84. [Russian].

Studies of 119 cultivars grown at Taškent showed that within *Gossypium hirsutum* the oil content in the seeds varied from 36·6 to 44·3%, the content of gossypol from 0·61 to 1·32%, protein from 27·8 to 35·2% and total ash from 4·31 to 5·37%. Early-maturing varieties had smaller seeds and lower gossypol and oil and higher protein and ash contents than late varieties. Seeds with low gossypol content were found in forms from Armenia, USA, Iran and Africa.

In *G. barbadense* the highest oil content was 29·0% and the gossypol content varied from 1·5

to 2·03% and the protein from 26 to 31·4%. In *G. herbaceum* the highest oil content was 39·3–40·1%, the protein content varied from 28·7 to 33·2% and the gossypol from 0·21 to 0·68%. Wide variation was found in *G. arboreum*, with values from 35·8 to 42·6% for oil and 25·9 to 35·6% for protein content, and certain forms from China and Korea are mentioned as combining high values for both oil and protein; gossypol contents varied from 0·20 to 0·84%.

No correlation was found between oil content and seed size, percentage of embryo, lint percentage or content of gossypol. Several forms combining high oil content with low gosspyol content are mentioned as promising breeding material.

The differences between the Old World and the New World species are thought to be accounted for by the fact that the former evolved in arid territory and the latter in relatively humid conditions.

4120 Jaroš, N. P.
**(The effect of water supply on biochemical changes in cotton leaves and seed).**
Fiz. Rasten. (Phys. Pl.) 1959 : **6** : 205–08. [Russian].

Data on the fat and gossypol contents of the seed for five varieties grown under irrigation and rainfed conditions at Taškent are provided.

4121 Turks, L.
**(The question of breeding cotton varieties resistant to wilt).**
Hlopkovodstvo (Cotton Growing) 1959 : No. **4** : 31–32. [Russian].

Cotton varieties differing in *Verticillium* resistance were crossed and the resulting $F_1$, $F_2$ and $F_3$ were grown under conditions of artificial infection at the Fergana Branch of the All-Union Cotton Institute. A table shows the percentages of resistant, susceptible and highly susceptible progenies from the following types of crosses: (1) resistant x resistant; (2) susceptible x susceptible; (3) susceptible x resistant; and (4) resistant x susceptible. It was found that the percentages of resistant forms in the progenies varied from 3·4% to 28·6%, being highest when the maternal parent or both parents were resistant. The progenies from the crosses resistant x resistant exceeded the initial forms in the degree of resistance. Studies of exact methods for directed training for resistance are advocated.

4122 Igron, È. A.
**(Is this the way a research station should work ?)**
Lën i Konoplja (Flax & Hemp) 1959 : No. **4** : 41–43. [Russian].

The conduct of research at the Pskov regional research station is criticized, though some new distant hybrids of flax are referred to as superior to the standards Svetoč [Torch] and $1288_{12}$ in seed and fibre yield.

4123 Sizova, M. A.
**(Study of the process of fertilization in interspecific crosses of flax).**
Trud. priklad. Bot. Genet. Selekc., Sborn. Puškinskih Lab. (Bull. appl. Bot. Gen. Pl.-Breed. Works of Puškin Lab.) 1958 : No. **1** : 303–11. [Russian].

Details are given of the development of the female gametophyte in *Linum angustifolium, L. grandiflorum, L. alpinum, L. austriacum, L. flavum* and *L. viscosum*. The greatest similarity to *L. usitatissimum* in form of embryo sac was found in *L. angustifolium*. Similarities were also observed between *L. grandiflorum* and *L. flavum* and between *L. alpinum, L. austriacum* and *L. viscosum*.

In the formation of the male gametophyte it was established that the generative nucleus divides before the pollen grain starts to germinate. No differences between the species were observed except in size of the pollen grains and of the sperms, which were shown to be complete cells and not isolated nuclei.

Two interspecific crosses were examined, *L. angustifolium* x *L. grandiflorum* and *L. usitatissimum* x *L. grandiflorum*. In both crosses the pollen germinated and fertilization was effected; though the union of the male and female nuclei could not be observed, partially developed embryos were seen occasionally. In all other interspecific combinations the pollen germinates but does not grow down the style.

4124 Kondakov, N. A.
**(Utilizing vegetative hybridization in flax breeding).**
Trud. tomsk. Univ. (Proc. Tomsk Univ.) 1957 : **140** : 136–40 : from Ref. Ž. (Ref. J.) 1958 : **22** : Abst. 98973 : p. 36. [Russian].

Descriptions are given of seed progenies of vegetative and vegetative-sexual hybrids bred at Tomsk. The initial components differed in 1000-seed weight, fibre yield and vegetation period.

4125 Ševčuk, T. N.
**(Local varieties of fibre plants of Transcarpathia).**
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1958 : **31** : No. 3 : 212–21. [Russian].

The main characteristics of the flax forms collected in Transcarpathia are described. Some of them possess useful features such as standing capacity, resistance to *Fusarium lini*, a yield of up to 10·6 c. per ha. of fibre of good quality, high seed yield and oil content up to 40·4%. Most of the Transcarpathian hemps are distinguished by high yields of fibre and seed and show resemblances to Italian hemp. Some forms are better than the central Russian standard in yield of fibre, and equal to them in fibre quality and oil content.

4126 Culbertson, J. O., Comstock, V. E. & Frederiksen, R. A.
**Further studies on the effect of seed coat color on agronomic and chemical characters and seed injury in flax.**
Agron. J. 1960 : **52** : 210–12.

Data from isogenic lines in the $F_{20}$ have confirmed the findings in the $F_{10}$ generation that it would be difficult, if not impossible, to combine the characters of high oil content and high iodine number of the yellow-seeded parent with the higher yield and greater freedom from pathological seed injury of the brown-seeded parent [cf. XXVI, 2729]. The lines were selected from Crystal (yellow seeds) x Biwing (Brown seeds) back crossed three times to Biwing.

4127 Doubly, J. A., Flor, H. H. & Clagett, C. O.
**Relation of antigens of *Melampsora lini* and *Linum usitatissimum* to resistance and susceptibility.**
Science 1960 : **131** : p. 229.

For use as antigens in the preparation of specific rabbit antisera, globulins were prepared from uredospores of races 1, 19, 22 and 210 of *M. lini* and from four differential hosts, viz. Bison and three lines respectively selected from the $BC_7$ of Bison with Cass, Koto and Ottawa 770B. Each globulin contained not only its specific antigen but also certain of the rust antigens as well as certain of the flax antigens. Host plants possessing a specific rust antigen as a minor constituent were susceptible to a race characterized by that antigen, while hosts lacking a rust antigen as a minor constituent were resistant to a race characterized by that antigen. No correlations were however detected for the characteristic flax antigens or flax antisera as regards either host reaction or pathogenicity.

4128 Hoffman, G. M.
Untersuchungen über den Stengelbruch und die Stengel- und Blattbräune des Leins (*Polyspora lini* Laff.). [**Investigations on stem break and stem and leaf browning of flax (*P. lini* Laff.)**].
Phytopath. Z. 1960 : **38** : 321–41.

Varieties differed in their susceptibility to *P. lini* when tested under natural conditions. Belgischer Faserlein [Belgian flax], Bernburg 26 and Bernburg 112 were only slightly attacked. Further tests are needed to confirm these results, which were obtained in an experiment lasting only one year.

4129 Stam, Ja. M.
**(Resistance to *Fusarium* wilt in flax of different geographical groups).**
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1958 : **31** : No. 3 : 98–111. [Russian].

In tests carried out on highly infected soil, 63% of the samples tested, the majority of which were linseed types, proved susceptible but resistant forms were found in material from most geographical areas, particularly among the land races. Contrary to expectation, many of the dual-purpose flaxes of the USSR are not specially resistant to *Fusarium*. The linseeds of the Far East contain a relatively high proportion of resistant forms and those of Ethiopia the highest. Among the breeders' varieties, several from Argentina and Uruguay proved resistant; some of those from the USA and Canada were less resistant than expected from published reports and in certain varieties both resistant and susceptible lines were discovered. Resistance was found in forms of *Linum usitatissimum* var. *crepitans* and *L. austriacum*. A list is given of the specimens with the highest resistance.

4130 Iwasawa, M. & Kushima, K.
**(Studies on the sensitivity of flax varieties to temperature and light).**
Utsunomiya Daigaku Nogakubu Gakujutsu Hokoku/Bull. Coll. Agric. Utsunomiya Univ. 1959 : **4** : 133–41. [Japanese].

With the object of breeding varieties suitable

for planting in rice fields before the rice crop on the Japanese mainland, a series of mainly European varieties was tested under high and low temperatures and long and short photoperiods. Data were obtained on stem length and flowering period.

4131 Arinštejn, A. I. & Loseva, Z. E.
**(Breeding monecious hemp and elucidation of the conditions favouring its manifestation).**
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1958 : **31** : No. 3 : 201–11. [Russian].

Some 20 different sexual types have been obtained by selection from natural populations. By selection from a monecious feminized male, the proportion of monecious plants was raised from 68·7% in 1944 to 93·0% in 1950, the proportion of feminized males falling from 22·8% to 6·4%, the females from 5·1% to 0·1% and the males from 2·4% to 0·5%. The male flowers in the selected line open before the female, so little or no cross pollination with other varieties occurs; the proportion of males rose to only 5·1–9·9% after two years of selfing without selection, provided the plants were kept at a distance of 2 km. from other varieties.
The feminized males showed a distinct tendency to change into monecious plants, this process being favoured by long day, high NPK manuring and humidity.
The monecious selection of central Russian hemp is early and has a high proportion of long fibre; in fibre yield it exceeds one of the two standard varieties by 5%. A similar selection for southern Russia still only has 73% of the fibre yield of the standard variety Krasnodar but is recommended on account of its labour saving. The former variety is very similar in type to the monecious hemp selected at Bernburg in Germany.

4132 **(The results of experiments on the regional standardization of superior kinds of jute throughout the country).**
Nung-yeh-hsueh Pao (J. Agric.)/Act. agric. sin. 1959 : **10** : 521–30. [Chinese].

The results of trials of seven varieties, one Indian and six Chinese, at nine Chinese localities during 1956–58 are reported. Information is given on morphology, vegetative period, and yield of stems and fibre.

4133 Datta, R. M. & Dana, S. K.
**Interspecific hybridization between *Corchorus olitorius* Linn. (strain C.G.) and *C. sidoides* F. Muell., and *C. capsularis* Linn. (strain D 154) and *C. sidoides* Muell.**
Biol. Plant., Praha 1960 : **2** : 61–66.

A cross of *C. olitorius* x *C. sidoides* gave a pod set of 29·4%, and 20% of these pods remained on the plant until maturity but they were all empty. In the reciprocal cross, pod set was 26·8%, and 9·0% of these pods were harvested; one pod contained seeds, none of which were viable. Pod sets for the cross of *C. capsularis* x *C. sidoides* and the reciprocal cross were 31 and 20% respectively and none of the pods reached maturity. In interspecific crosses, the rate of pollen tube growth in the style in both *C. olitorius* and *C. capsularis* was slower than after self pollination and only the uppermost ovules were fertilized. Delay in fertilization and abnormalities in embryonic development have also been observed after crossing. It is concluded that these three species of *Corchorus* are widely separated phylogenetically.

4134 Chaudhuri, K. L.
**Early maturing X-ray mutations of jute, *Corchorus olitorius* Linn.**
Trans. Bose Res. Inst. 1953–55 : **19** : 89–105.

From dry seeds irradiated with 8000 and 11,200 r., five mutants were obtained which flowered in 52–55 days compared with 110 days for the control. In the $X_2$ and $X_3$ raised from the early selections, no plants were as early as the mutants and the populations were respectively only 14–35 and 6–20 days earlier than the controls.

4135 Datta, A. N. & Kundu, B. C.
**You will like this non-bristle roselle.**
Indian Fmg. 1960 : **10** : 13, 21.

A variety of *Hibiscus sabdariffa* without bristles has been developed at the Jute Agricultural Research Institute, Barrackpore, India, from a single-plant selection from an indigenous collection of the bristled green type. Although not equal in yield to improved bristled varieties, it outyields local types.

4136 Gupta, S. C., Thombre, M. V. & Desai, M. C.
**A case of triploidy in ramie.**
Curr. Sci. 1960 : **29** : 191–92.

The occurrence of a sterile selection of *Boehmeria*

*nivea* with $2n = 42$ is reported from the College of Agriculture, Poona.

4137 Pancho, J. V. & Capinpin, J. M.
**Cytotaxonomic study of the fiber-producing *Musa* in the Philippines. I. Chromosome numbers in the section *Australimusa*.**
Philipp. Agric. 1959 : **43** : 397–403.

All but two of the 73 varieties of *M. textilis* examined had $2n = 20$; $x = 10$ is therefore considered to be the basic number in sect. *Australimusa*. Meiotic and mitotic observations revealed the absence of chromosomal irregularities. The remaining two forms, viz. an accession of Minay and a *M. balbisiana* x *M textilis* hybrid, had $2n = 21$.

## SUGAR AND STARCH PLANTS

4138 Rao, J. T. & Krishnaswami, M. K.
**Assessing the breeding behaviour of *Saccharum spontaneum* variants.**
Indian J. Sugarcane Res. Developm. 1957 : **1** : 164–70.

The collection of *S. spontaneum* at Coimbatore exceeds 400 different forms. Those of special interest in respect of (1) vigour and tillering, (2) sucrose content, (3) tolerance of drought, (4) tolerance of salinity, (5) tolerance of water-logging, or (6) tolerance of low temperature are listed. Crosses have been made between selected *S. spontaneum* forms used as pollen parents and POJ213, POJ2725, Co.213, Co.281, Co.349, B6308, BA11569 and Maur. 1237, all with a low percentage of open anthers, as the female parents. The agronomic performance of the seedlings is recorded. *S. spontaneum* 'SES45', 'SES74B' and 'SES84A' are noted as satisfactory parents for imparting vigour and tillering to their progeny.

4139 Samuels, G., Alers-Alers, S. & Landrau, P. (Jun.).
**The influence of time of harvest and age of sixteen sugarcane varieties on their sucrose content.**
J. Agric. Univ. PR 1960 : **44** : 1–10.

Sixteen varieties were planted at the same time at Rio Piedras, Puerto Rico, and harvested at 15-day intervals from the ages of 6 to 23 months. The varieties differed widely in average sucrose percentage and tonnage. They also displayed marked differences in the time of year when they had the lowest and highest sucrose content. Maximum yields of 96° available sugar per acre for the mean of the 16 varieties were obtained at the age of 18·5 months. A ranking of the varieties is given showing when they attained their maximum sucrose percentages at the ages of 6–12 and 18–23 months.

4140 Dutt, N. L. & Hussainy, S. A.
**Latest developments in sugarcane breeding adopted at Coimbatore.**
Indian J. Sugarcane Res. Developm. 1957 : **1** : 123–29.

The following improvements in breeding technique are described: (1) isolation of arrows by rooting the canes by the tile-potting method; (2) bringing cut tassels to bloom in an $H_2SO_3$ or $H_2SO_3 + H_3PO_4$ solution; (3) rooting in polythene bags; (4) bagging arrows in cellophane; (5) use of glazed earthenware pans for sowing; (6) use of small tile-pots to minimize transplantation shock; (7) detachment of tillers at the tile-pot stage to increase planting material; (8) October planting to enable late varieties to be sent in time to north Indian testing stations; and (9) use of polythene for long-distance transport of cane setts.

4141 Khanna, K. L., Sharma, S. L. & Srivastava, R. C.
**Outstanding canes of Bihar. II.—B.O.10 : a combination of high resistance to red rot, yield and sucrose.**
Indian J. Sugarcane Res. Developm. 1957 : **1** : 202–09.

A full description is given of the above variety, a selection of Co.331 x POJ2878. It is of particular interest as being resistant to the new strain of *Glomerella tucumanensis* to which BO.11 is susceptible.

4142 Vijayasaradhy, M. & Vanithamony, P.
**Experimental studies of the factors controlling flowering in sugarcane. II. Effect of extra dark treatment in relation to age and month of planting.**
Indian J. Sugarcane Res. Developm. 1957 : **1** : 210–19.

A treatment involving 4 hr. extra darkness each day resulted in curtailment of the period required for flowering. This effect was most pronounced in planting in June or later and was more marked in plants that were 18 weeks old than in those that were 6 weeks old.

4143 D'Emmerez de Charmoy, D.
Études au sujet d'une récente réapparition de gommose à la Réunion. (**Studies on the subject of a recent reappearance of gummosis in Reunion**).
Rev. agric. Réunion 1959 : **59** : 287–94.
Forty-five sugar cane varieties are classified according to their reaction to *Xanthomonas vasculorum*.

4144 Chu, T. L., Leu, L. S. & Bau, Y. S.
**Progress report on the study of the mode of resistance of genus *Saccharum* and its relatives to downy mildew.**
Taiwan Sug. 1959 : **6** : No. 12 : 26–31.
Tests were carried out during 1955–58 at the Hsinchu station, northern Taiwan, to determine the reaction of a large number of sugar-cane varieties of hybrid origin to downy mildew (*Sclerospora sacchari*), as well as of some varieties of *Saccharum* spp. and a number of relatives of the genus. Varieties of *S. sinense* and *S. barberi* were as a group more resistant than varieties of *S. officinarum* and *S. robustum*. None of the varieties of *S. spontaneum* were infected. Representatives of *Narenga*, *Erianthus* and *Miscanthus* were immune or highly resistant. Varieties of *Zea mays* were highly susceptible. Data on the frequency distribution for degree of susceptibility of $F_1$ derivatives of N : Co. 310 (resistant) x PT43–52 (highly susceptible) and N : Co. 310 x F108 (highly resistant) showed that sugar cane is highly heterozygous for reaction to downy mildew, which probably depends on more than one gene. The resistance of Kassoer and its nobilized hybrids is probably dominant.

4145 Gallarate, G.
Una sperimentazione capillare di grande portata. (**A series of small-scale experiments of great significance**).
Agricoltura, Roma 1960 : **9** : No. 4 : 51–58.
In a discussion of recent Italian legislation to control the varieties of agricultural crops that are grown, it is pointed out that sugar-beet cultivars are international and no types with special local adaptation are known to exist, strains from nine different countries being grown in Italy. On the basis of the numerous comparative tests carried out by the National Beetgrowers' Association [cf. XXIX, 2910], indications are given of the types most suitable for growing in different parts of Italy and under different conditions.

4146 Kotukov, G. N.
(**Breeding methods for sugar beet**).
Sahar. Svekla (Sug. Beet) 1959 : No. 5 : 36–38. [Russian].
Intravarietal selection of seed beets for branching and spreading stems resulted in the selection of more vigorous plants, with improved seed yield and increased 1000-seed weight, in experiments conducted at Har'kov and other places over many years. The progeny raised from the seed of selected plants was distinguished by high root and sugar yields and was superior in these respects to selections of one-year-old beets for large roots and high sugar content.

4147 Sukačev, V. P.
(**Sugar-beet varieties for cultivating in squares or clusters**).
Sahar. Svekla (Sug. Beet) 1959 : No. 6 : 39–40. [Russian].
Breeding sugar beets, in particular N types which respond to wide spacing by improved productiveness, at Veselyj Podol is discussed. New varieties such as VP047 and VP062 were derived from material which had this desirable character and was also resistant to drought and salinity. In addition to the above varieties, a series of élites has been raised which are more productive of roots when the plants are sown at wider spacings. The sugar content of these élites also increased with the wider spacing in dry seasons, though reductions in their sugar contents occurred in seasons with ample rainfall. Some élites in which the reduction in the sugar content amounted to less than 0·3% were selected. They include élite 1/55 of the hybrid VP112 x VP782. It is being multiplied for advanced trials.

4148 Payne, M. G., Powers, L. & Maag, G. W.
**Population genetic studies on the total nitrogen in sugar beets (*Beta vulgaris* L.).**
J. Amer. Soc. Sug. Beet Tech. 1959 : **10** : 631–46.
The amount of nitrogen in the thin juice was determined in a commercial variety, an open-pollinated bulked population derived from it, two inbreds, their $F_1$ hybrid and an open-pollinated bulked population from one of the inbreds. All the populations were grown on (1) unfertilized plots and (2) plots with NP fertilizer. Significant differences in nitrogen content were found between the populations and within the commercial variety, its bulked derivative and the bulked derivative of the

inbred. Smaller amount of nitrogen was either dominant or heterotic. The size of the differences in nitrogen content between populations was of the same order as that between treatments. The differences between populations were significantly greater on the fertilized plots.

4149 Fedorov, A. I. & Snegur, G. P.
**(Utilizing heterosis of hybrid sugar-beet seed).**
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1959 : No. 3 : 18–21. [Russian].

An account of testing different sets of components for production of heterotic seed in the Ukraine is given. The best results were obtained from the crosses R06 x V020 and between U752 x V020. The heterotic hybrids yielded 24 and 25 c. more roots per ha. than the parent varieties and 4·4 and 4·9 c. more sugar respectively.

4150 Sevost'janov, S. P.
**(Regional varietal testing of sugar beet).**
Sahar. Svekla (Sug. Beet) 1959 : No. 4 : 41–44. [Russian].

Trials of over 200 varieties, including many monogerm beets, conducted by the Institute of Sugar Industry at 3 breeding stations and 24 other places are reported. Among the varieties with high root and sugar yields which are recommended for state varietal trials were the following. R57–59 was obtained at Uladovo-Ljulincy by combining the best families from single-plant selection of the tonnage variety U752. K064 is a hybrid obtained at the Kirgiz breeding station from the cross of the *Erysiphe*-resistant variety K018 with the variety Ja010 from Jaltuškov. R57–04 was developed at the Čerkassk breeding station by selection of high-yielding types resistant to storage rot from V03. In addition to these, mention is made of monogerm varieties from Belaja Cerkov' and Jaltuškov which have root and sugar yields only slightly lower than those of polygerm varieties. The best monogerm beets, Ja552 and Ja557, were superior in these respects to such standard varieties as U752, R06, Ja02, R632 and R931 in many localities.

4151 Kotukov, G. N.
**(The use of some second-year characters of sugar beet for breeding).**
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1958 : **31**: No. 3 : 230–44. [Russian].

Mature sugar beets were classified according to the length of the flowering shoot, its degree of branching and other characters. Those with long stems had a slightly longer vegetation period, larger leaves and stipules, heavier seed and higher seed yield. The beets grown in the Soviet Union proved to be mainly of this type whereas those from Germany were predominantly forms with short stems. There was a high correlation between the morphological characteristics of the beets in the second year of growth and those of their progenies in the first year of development, those with the long stems giving progeny with higher root yield and sugar-content and a 6–11% higher yield of sugar. One line selected on this basis from the variety U1718 gave a root yield of 489·6 c. per ha. and a sugar yield of 92·5 c. per ha. compared with 456·0 c. and 87·5 c. respectively in the original variety. Increases of a similar order in sugar yield were produced by selecting for large seed balls and for early flowering. Selection for leaf number and leaf length led to an increase in root weight in the first year and in seed yield in the second.

4152 Coe, G. E. & Klitgaard, K.
**A procedure for squash preparations of somatic sugar beet tissues.**
J. Amer. Soc. Sug. Beet Tech. 1959 : **10** : 609–11.

The outstanding feature of the procedure described, which is applicable to either leaves or root tips, is a combination of the macerating, killing and fixing processes by means of a mixture of 7 parts Newcomer's fluid and 3 parts 1 N HCl. Before treatment with this mixture, the material is placed in 8-hydroxyquinoline solution as a shrinking agent for 3½–4 hr. Synthetic orcein and two sources of spirit-soluble nigrosin were satisfactory for staining.

4153 Donà dalle Rose, A.
Sull'analisi delle marche commerciali del seme bietole poliploide. (**Analysis of the commercial brands of polyploid beet seed**).
Agricoltura d. Venezie 1960 : **14** : 248–56.

The methods used in various laboratories for determining the percentage of triploids by chromosome counts on root tips are outlined, together with indirect methods such as counting the chloroplasts in the stomatal guard cells or number of chromocentres in the nucleus. Since a suitably trained staff can make up to 140 counts a day the direct method, with its greater accuracy, is preferred to the indirect ones.

4154 Rusconi-Camerini, G.
La barbabietola poliploide. **(Polyploid beet).**
Agricoltura, Roma 1960 : **9** : No. 4 : 47–49.
In a general account of the advantages of polyploid beets, emphasis is placed on the importance of selecting the tetraploid lines that will give the best triploids when crossed with the diploids. Polyploid strains give more regular yields over a period of years; figures for 1959 showed that the highest yields of sucrose per ha. were given by the polyploids Alba P, with 77·32 c., and Klein Polybeta, with 71·73 c., compared with 57·30 c. from Rimpau E.

4155 Deneuche, J.
L'analyse numérique de la composition des populations de betteraves polyploïdes dans le travail de sélection. **(The numerical analysis of the composition of populations of polyploid beets in breeding work).**
Genet. agr. 1960 : **11** : 268–76.
It is concluded that guard-cell chloroplast counts are much less subject to error than chromosome counts for the rapid determination of the degree of polyploidy in sugar-beet plants.

4156 Stein, H., Gabelman, W. H. & Struckmeyer, B. E.
**Reversion in cytoplasmic male sterile plants of *Beta vulgaris*.**
J. Amer. Soc. Sug. Beet Tech. 1959 : **10** : 619–23.
Cytoplasmic ♂-sterile sugar beets were crossed with fertile table beets. Many of the derived sterile pigmented segregates in the progenies produced by back crossing with table beets appeared, initially, to be typical cytoplasmically sterile plants with the genotype *S xx zz*. In the flowers developed latest, however, such segregates produced a varying percentage of fertile pollen (3–19%). This reversion to partial fertility depended upon some internal condition. It occurred in plants in which the vegetative-generative balance had been shifted towards the generative phase very early as the result of long days and low temperature. The observations supported the hypothesis that cytoplasmic sterility is determined by a diffusible substance, rather than by particulate determinants.

4157 Stein, H. & Gabelman, W. H.
**Pollen sterility in *Beta vulgaris* associated with red pigmentation of the anthers.**
J. Amer. Soc. Sug. Beet Tech. 1959 : **10** : 612–18.
A fuller report is given of this investigation [cf. XXIX, 1821].

4158 Finkner, R. E., Finkner, M. D. & Olson, R. F.
**Effects of storage on raffinose content of sugar beets. I. Varietal changes occurring during storage.**
J. Amer. Soc. Sug. Beet Tech. 1959 : **10** : 481–88.
While varietal differences were observed in the rate of increase in the raffinose content of stored roots, the varieties retained their original ranking when assessed for percentage raffinose at the end of the nine-week storage period.

4159 Negovskij, N. A. & Tkačenko, A. A.
**(Improving the productiveness of monogerm sugar beet).**
Sahar. Svekla (Sug. Beet) 1959 : No. 5 : 38–41. [Russian].
Considerable differences in root and sugar yields, growth periods and percentages of bolters were observed at Uman' between the progenies of different biotypes of monogerm beet which have been selected from Belaja Cerkov' [cf. 1800]. The midseason biotypes had higher root and sugar yields than the late and early biotypes. They also had a lower percentage of bolters than the early biotypes. The methods for improving the productiveness of monogerm beet by selection, including selection for midseason maturity, are discussed. Mention is also made of experiments at Uman' and Kiev on production of heterotic seed by crossing the monogerm variety Belaja Cerkov' with the polygerm variety U752 or by fertilization of Belaja Cerkov' or R06 with pollen mixtures of R06 + Belaja Cerkov'. The plants raised from the heterotic seed exceeded Belaja Cerkov' in root and sugar yields.

4160 Powers, L., Finkner, R. E., Rush, G. E., Wood, R. R. & Peterson, D. F.
**Genetic improvement of processing quality in sugar beets.**
J. Amer. Soc. Sug. Beet Tech. 1959 : **10** : 578–93.
With reference to published and unpublished results obtained in the USA, the possibility of

genetic improvement of processing quality is assessed. Heterosis for sucrose percentage has been expressed in $F_1$ hybrids between inbreds under diverse climatic conditions. In addition, dominance or partial dominance for higher sucrose percentage has been found fairly frequently. Data on the inheritance of sodium, potassium and raffinose content show that the amounts of these constituents may be increased or decreased by breeding. Analyses of associations of characters have indicated that desirable recombinations for root yield, sucrose percentage and contents of other constituents may be obtained. Contents of nitrogenous compounds are not closely correlated with those of other chemical components. Populations differ in ability to produce higher sucrose percentage at higher N-fertilizer concentration. Breeders may therefore be expected to aid in the solution of problems encountered because of the application of greater amounts of N fertilizers.

4161 Donà dalle Rose, A.
Controllo qualitativo della barbabietola da zucchero: l'automatismo in aiuto al selezionatore. (**Qualitative testing of sugar beet: automation as an aid to the breeder**).
Agricoltura, Roma 1960 : **9** : No. **4** : 43–46.
At the sugar-beet research station at Rovigo in Italy, determinations of the contents of sucrose, noxious nitrogen and ash are all mechanized and details are given of the apparatus used.

4162 Schneider, C. L.
**Field inoculation of sugar beets with *Aphanomyces cochlioides* Drechs.**
J. Amer. Soc. Sug. Beet Tech. 1959 : **10** : 647–50.
Mechanical application of artificial inoculum in the drill row at the time of sowing enhanced incidence of the disease. This method is suggested as a means of increasing uniformity of exposure to infection in field tests of the reactions of strains.

4163 Noll, A.
Untersuchungen über die Variabilität von *Cercospora beticola* auf künstlichem Nährboden. (**Investigations on the variability of *C. beticola* on an artificial nutrient medium**).
NachrBl. dtsch. PflSchDienst., Stuttgart 1959 : **11** : 181–85.
Morphological variants of *C. beticola* which arose on artificial media remained unchanged after several transfers to the same media and also after passing through host plants. Many of the variants were less virulent than the original cultures and it is concluded that artificial cultures should not be used in testing sugar beets for resistance to the fungus.

4164 Chiu, W.-F., Chang, I.-H., Hsieh, C.-C., Cheo, Y. & Hang, S.-Y.
(**Studies on epidemics of sugar-beet yellows in Inner Mongolia**).
Chih-wu Ping-li-hsueh Pao (J. Pl. Path.)/ Acta phytopath. sin. 1959 : **5** : 53–64. [Chinese].
All 54 varieties of sugar beet studied at the Inner Mongolian Sugar Beet Experimental Station in 1956 proved susceptible to yellows though $Aj_3$, $PzHR_4$, Rogow C and a locally raised hybrid showed some resistance. The widely grown variety $M_2$ is very susceptible.

4165 Cürth, P.
Vegetative Zuckerrüben in sechsten Vegetationsjahr. (**Vegetative sugar beets in the sixth year of growth**).
Züchter 1959 : **29** : 374–75.
Plants of Kleinwanzleben N sown in 1954 were devernalized by treatment at + 30° C. during the flowering stage in 1955 and 1957 and at + 15° C. in 1959 and in this way were kept alive until the sixth year.

4166 Jennings, D. L.
**Observations on virus diseases of cassava in resistant and susceptible varieties. I. Mosaic disease.**
Emp. J. exp. Agric. 1960 : **28** : No. 109 : 23–34.
Plants of "resistant" varieties of *Manihot esculenta* and of various interspecific hybrids [cf. XXVIII, 785] frequently become infected without showing disease symptoms. Further, the virus does not always remain systemic in the stem but moves downwards to the basal parts of the plant. From trials conducted in Kenya, Tanganyika and Uganda it is considered that mosaic resistance may be due, at least in part, to the ability of the plant to restrict the virus to its basal parts, and that this may be influenced by a number of factors such as growing conditions, the length of the growth period and the density of the vector population.

## STIMULANTS

4167 Jones, G. L., Matzinger, D. F. & Collins, W. K.
**A comparison of flue-cured tobacco varieties repeated over locations and years with implications on optimum plot allocation.**
Agron. J. 1960 : **52** : 195–99.

A detailed report is given of an analysis of data from tests of seven varieties in a randomized block design at the same five centres in North Carolina for a three-year period [cf. XXIX, 194]. It was concluded that tobacco varieties may be adequately evaluated in this state on the basis of data obtained in two years from five centres per year and three replications per locality.

4168 Bolsunov, I.
Die gegenwärtige Situation im Anbau und in der Züchtung von Burley-Tabaken in Europa und Aussichten für die Zukunft. (**The present situation in the cultivation and breeding of Burley-type tobaccos in Europe and their prospects of development**).
Unitab, Paris 1960 : No. 14 : 11–15; also in French, 16–21.

A review is given of attempts in various European countries to develop Burley-type tobaccos which are better adapted to local conditions.

4169 Chaplin, J. F.
**Interspecific hybridization, gene transfer, and chromosomal substitution in *Nicotiana*.**
Diss. Abstr. 1959 : **20** : LC Card Mic 59–2511 : 461–62. (Abst.).

Somewhat more detailed information is given on investigations already briefly reported [cf. 1209].

4170 Scossiroli, R. E. & Wittmer, G.
Richerche genetiche su caratteri quantitativi in *Nicotiana*. Nota V. Studio della variabilità genetica di 6 caratteri quantitativi nella cultivar Virginia Bright. (**Genetic researches on quantitative characters in *Nicotiana*. V. Study of genetic variability of 6 quantitative traits of the cultivar Virginia Bright**).
Tabacco, Roma 1960 : **64** : No. 694 : 98–103.

In an experiment on the application to tobacco of the method of Lerner for animal improvement, ten families of line White Mammoth of Virginia Bright were set up consisting of one plant selected as pollen parent and several plants, usually some ten per family, as seed parents. The progenies were analysed in 1957 in respect of height of plant up to the insertion of the inflorescence, number of leaves, their length and breadth and the ratio between the two, and time of flowering. Tabular data are given showing the degree of heritability ($h^2$), the phenotypic and environmental variance and the genetic variance calculated for the male parent, the female parent and the two combined. The values of $h^2$ were high, indicating the possibility of selecting effectively for each of the characters in question.

4171 **Improved binder tobacco.**
Agric. Res., Wash. 1960 : **8** : No. 11 : p. 16.

Developed at the Wisconsin Agricultural Experiment Station, Havana 501 combines resistance to wild fire, mosaic and black root rot. It was bred by crossing TL106 (wild-fire resistant) with Havana 211 and repeatedly back crossing with Havana 307, Havana 322 and mosaic-resistant N14–3.

4172 **Virginia 12 is new flue-cured tobacco.**
Crops & Soils 1960 : **12** : No. 6 : p. 21.

Virginia 12 (Virginia Gold x Hicks), released by the Virginia Agricultural Experiment Station, is resistant to black root rot and gives high yields of good-quality, full-bodied tobacco with good colour and texture.

4173 Swaminathan, M. S. & Murty, B. R.
**Aspects of asynapsis in plants. I. Random and non random chromosome associations.**
Genetics 1959 : **44** : 1271–80.

Segregation was observed for different degrees of asynapsis during microsporogenesis in the second segregating generation of the sixth back cross of $F_1$ *Nicotiana rustica* x *N. tabacum* to *N. rustica*. It is considered that asynaptic plants arise by spontaneous mutation and that the different degrees of asynapsis are determined by gene dosage effects.

The chromosome associations found in this material, together with some results obtained by different authors from asynaptic or desynaptic plants of different genera, were subjected to Poisson and binomial analyses and the following conclusions are drawn: (*a*) the odd bivalents found in completely asynaptic plants

are formed at random; (*b*) as the mean bivalent frequency approaches one half the potential number of bivalents, there is a gradual departure from Poisson or binomial distribution which ends in a very wide deviation where $n/2$ or more bivalents are formed; and (*c*) this type of behaviour, wherein specific homologous pairs in a chromosome complement show ability to pair under conditions which lead to asynapsis in other pairs, is prevalent among all types of plants, whether they be diploids, secondary polyploids or primary polyploids of various types.

4174 Sand, S. A.
**Autonomy of cytoplasmic male sterility in grafted scions of tobacco.**
Science 1960 : **131** : p. 665.

Sterile scions remained sterile and fertile ones remained fertile, irrespective of whether they were grafted on fertile or sterile stocks, throughout the period of more than 6 months during which they were observed.

4175 Tomková, J.
**Problems of autosterility in *Nicotiana alata* Link et Otto (formation of the inhibitory factor in the pistil).**
Biol. Plant., Praha 1959 : **1** : 328–29.

The results of preliminary experiments in which pollen tubes of *N. alata* were cultivated on agar in the presence of pulped tissue from pollinated and unpollinated pistils indicate that the inhibitory factor is present in the pistil before pollination.

4176 Swaminathan, M. S. & Murty, B. R.
**Effect of X-radiation on pollen tube growth and seed setting in crosses between *Nicotiana tabacum* and *N. rustica*.**
Z. VererbLehre 1959 : **90** : 393–99.

The rate of pollen tube growth increased with radiation dose until this reached 7,200 r. and 9,600 r. in *N. tabacum* and *N. rustica* respectively; with greater doses the rate gradually decreased. Normally the cross *N. tabacum* x *N. rustica* is incompatible because the pollen tubes fail to grow down the full length of the style. When irradiated pollen was used in this cross, fertilization took place and viable seed was produced. Also in the reciprocal cross irradiated pollen gave a higher seed set than untreated pollen.

4177 Čirkovskij, V. I.
**(Can seed with good sowing properties be obtained from the peripheral capsules of tobacco inflorescences?)**
Tabak (Tobacco) 1960 : No. 2 : 38–41. [Russian].

The removal of capsules from the central portion of inflorescences in the variety Tyk-Kulak 92 promoted the development of the remaining capsules on plants at the Tobacco Institute and the weight of capsules and the 1000-seed weight were improved. Since inflorescences develop later at the periphery than in the centre and can produce seed of the same quality, it is thought that peripheral flowers might be useful for breeding early or frost-resistant varieties by crossing varieties with different growth periods.

4178 **Disease-resistant tobacco.**
Agric. Res., Wash. 1960 : **8** : No. 9 : p. 16.

Moore, E. L., Powell, N. T. & Gwynn, R.
**Better yields with NC75 new tobacco variety.**
Res. & Fmg. 1959 : **18** : No. 2 : p. 6.

Released by the USDA and North Carolina Agricultural Experiment Station, the flue-cured tobacco NC75 is highly resistant to black root rot and moderately resistant to black shank and *Fusarium* wilt. It has exhibited less susceptibility to brown spot than some commercial varieties and some field resistance to Granville wilt. NC75, whose pedigree involves Dixie Bright 102, Bottom Special and Beltsville 1–76, outyields NC73 [cf. XXIX, 4230] by about 9%. For appearance of the cured leaf, NC75 was rated slightly above NC73 and somewhat below Hicks Broadleaf. It was classed just below both these varieties in flavour and aroma.

4179 Bahtadze, K. E.
**(New Soviet-bred tea varieties).**
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1959 : No. 3 : 48–52. [Russian].

Tabulated information on the yields and biochemical properties of the leaves of some Soviet cultivars which have already been described is presented [cf. XXVIII, 801].

4180 Keegel, E. L.
**Tea made from clones.**
Tea Quart. 1959 : **30** : 134–41.

A large number of clones are classified as to quality on the basis of evaluations of the liquor

made from samples prepared by the mincing-machine technique from bushes grown at the Tea Research Institute and on estates in Ceylon.

4181 Hutchinson, M. T.
**Resistance and tolerance of tea to nematodes.**
Tea Quart. 1960 : **31** : 13–18.
Ways in which resistant and tolerant reactions to *Pratylenchus coffeae* may be expressed are described and an outline is given of the results of selecting clones for resistance or tolerance in Ceylon and of projects in mind for the further testing of the reactions of clones so far selected. Eight of the clones are above the average in quality.

4182 Vishveshwara, S.
**Occurrence of a haploid in *Coffea arabica* L. cultivar "Kents".**
Indian Coff. 1960 : **24** : 123–24.
A natural haploid ($2n = 24$) of Kents, discovered at the Coffee Research Station, Balehonnur, India, is described. Meiosis was highly irregular, the degree of pairing ranging from complete asynapsis to $6_{II}$. Two of its branches underwent spontaneous doubling of the chromosome number. The similarity of the haploid to the rarely occurring aberrant of Kents popularly known as Fandu gida suggests that the latter is haploid. In morphological characters, the five seedlings derived from the haploid by open pollination range from the mother plant to normal Kents.

4183 Turner, P. D.
**Variation in *Phytophthora palmivora* (Butl.) Butl. on *Theobroma cacao* L. in West Africa.**
Nature, Lond. 1960 : **186** : 495–96.
At least two types of the pathogen have been recognized: the Ghana type, predominant in the more westerly countries, and the Nigerian, predominant in the easterly regions. Complementary strains for oospore production occur in the latter type but such isolates have not been found in the former. It is pointed out that the presence of complementary isolates within a particular territory could result in genetic variation and possible changes in pathogenicity.

4184 Nordestgård, A.
Forsøg med sorter af opiatvalmue 1948–1958. (**Trials of varieties of opium poppy, 1948-1958**).
Tidsskr. Planteavl 1960 : **63** : 848–55.
In trials conducted at four stations in Denmark, Luna and Flora were equal in seed yield and almost equal in content of crude fat and crude protein. Both were superior to Mahndorf.

4185 Sárkány, S., Andrásfalvy, A. & F.-Riedel [Farkas-Riedel], L.
**Data on growth and development in poppy.**
Acta agron., Budapest 1959 : **9** : 341–62.
The results of studies of the effects of sowing date, temperature and day length upon time of maturity, growth, capsule weight, seed weight and number of nodes on the main axis are reported for 25 varieties investigated at Budapest during 1955–57. Varietal differences in the above characteristics and in winter hardiness were noted.

4186 Tarkowski, C. & Zub, L.
Chmiel poliploidalny i jego wartość użytokowa. (**The polyploid hop and its agricultural value**).
Postępy Nauk Roln. 1959 : **6** : No. 2 : 45–50.
Reference is made to work done in England by Neve [cf. XXVII, 3348 and 2112] and Farrar [cf. XXVII, 2110]. Recognizing the advantages of the triploids, the authors have treated Polish hop cultivars with 1% solutions of colchicine; some of the treated plants resumed growth in the main shoot and were brought to flower and pollinated with cultivated diploid males. A few seeds have been obtained and will be sown in the spring.

4187 **Brewing trials of wilt-tolerant hops for the seasons 1952-1957.**
J. Inst. Brew. 1960 : **66** : 207–12.
A report is given on trials organized by the Hops Advisory Committee of the United Kingdom with the aim of finding a variety acceptable for replacing Fuggle as a copper hop. Of the five varieties tested, Density (D1), Defender (D3), Bramling Cross (OT48) and Janus (J2) were found suitable by most brewers, when used at a 25% substitution rate in normal hop grists.

## MINOR CROP PLANTS

4188 Majčenko, Z. G.
(**The clary variety S786**).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1959 : No. 3 : p. 74. [Russian].
S786 was selected from S27 in the Crimea. It is winter hardy, drought resistant and yields more essential oil per unit area than the standard

variety V1. The oil is of high quality, as it contains an increased proportion of complex ethers.

4189 Andronicescu, D. & Enăchescu, G.
Soiuri valoroase de ardei. (**Red-pepper varieties of value**).
Grădina Via Livada 1959 : **8** : No. 5 : 13–14. (Abst.).
Trials of introduced varieties and Rumanian breeding lines at the Ţigăneşti research station during 1954–58 are reported.

4190 Binder, I. & Cirillo, A.
Cele mai valoroase soiuri şi linii de ardei boia dulce pentru zona legumicolă Oradea. (**The most valuable varieties and lines of sweet peppers for the Oradea vegetable-growing zone**).
Grădina Via Livada 1959 : **8** : No. 5 : p. 16. (Abst.).
Trials of varieties and breeding lines in the above region during 1957–58 are reported.

4191 Angelescu, H. & Precup, I.
Cultura ardeiului in raionul Sinnicolaul Mare. (**The cultivation of red peppers in the Sinnicolau Mare region**).
Grădina Via Livada 1959 : **8** : No. 11 : 20–25.
Agronomic descriptions are included of the principal locally grown varieties of this Rumanian district.

4192 Simmonds, N. W. & Harrison, E.
**The genetics of reaction to pepper vein-banding virus.**
Genetics 1959 : **44** : 1281–89.
Seedling reaction was investigated in three varieties of *Capsicum annuum*, Ford Hook, Puerto Rico Wonder and Large Bell Hot, and in *C. sinense* Hot Yellow. Two loci were found to control disease reaction and the genetic constitutions corresponding to the reactions noted are symbolized as follows: $V_1V_2$, easily infected, vein necrosis, leaf abscission and death; $V_1v_2$, resistant, vein necrosis, partial abscission, stunted; $v_1V_2$, easily infected, severe mosaic, poor growth; and $v_1v_2$, resistant, mild mosaic, good growth. $V_1$ is incompletely dominant.
In a preliminary attempt to define the distribution of resistance in the genus, eight strains representing *C. sinensis*, *C. pubescens*, *C. frutescens* and *C. pendulum* were tested. It is concluded that susceptible genotypes, i.e. $V_2$ and $V_1V_2$, occur and may be general in *C. annuum*, but that other *Capsicum* species are predominantly resistant with $v_1v_2$ or $V_1v_2$ genotypes.

4193 Cook, A. A.
**Genetics of resistance in *Capsicum annuum* to two virus diseases.**
Phytopathology 1960 : **50** : 364–67.
Resistance to tobacco etch virus and potato virus Y in strains P11 and SC46252 of *C. annuum* is considered to result from the pleiotropic effects of a single recessive gene $ey^a$.

4194 Nirmal Singh Maini, Gursham Singh & Kuldip Singh Lobana
**Determination of combining ability in *Brassica campestris* by polycross test.**
Indian Oilseeds J. 1960 : **4** : No. 1 : 26–29.
A previous polycross test at the Oilseeds Research Station, Gurgaon, Punjab, revealed wide disparities in general combining ability among 16 inbreds of *B. campestris* var. *sarson* [cf. XXVIII, 3287]. Diallel crosses between three lines having high and three low combining ability were tested for seed yield, along with the inbred parents. The rankings of the single crosses and their ♀ parental inbreds were in very close agreement. The earlier polycross test gave a similar ranking of the inbreds, with the single exception of BS3–4, which was fourth in the single-cross and inbred test but sixth in the polycross trial. This line had a relatively high degree of self fertility, which may have reduced the amount of outcrossing in the polycross test. Single crosses of the type high x high combining ability gave the greatest yields, high x low or low x high combinations being intermediate in performance and low x low combinations invariably poor yielders.

4195 Swaminathan, M. S. & Sulbha, K.
**Multivalent frequency and seed fertility in raw and evolved tetraploids of *Brassica campestris* var. *toria*.**
Z. VererbLehre 1959 : **90** : 385–92.
Associations occurring during diacinesis and metaphase I of meiosis in microsporocytes were investigated in the $C_1$, $C_2$, $C_{17}$, $C_{18}$ and $C_{19}$ generations of induced tetraploids. The later generations had considerably fewer multivalents and more bivalents than the earlier generations. The mean numbers of seeds per siliqua in $C_1$ and $C_2$ plants were 1·5 and 3·0 respectively and the numbers were 14·5, 14·9 and 16·8 in the $C_{17}$, $C_{18}$ and $C_{19}$ generations respectively; these later generations were

obtained by the mass pedigree system of selection. The decrease in multivalent frequency and increase in seed fertility may be related.

4196 Olsson, G.
**Species crosses within the genus *Brassica*. I. Artificial *Brassica juncea* Coss.**
Hereditas, Lund 1960 : **46** : 171–223.

As shown by investigations at Svalöf, Sweden, crosses may be made readily between *B. campestris* and *B. nigra* at either the 2*x* or 4*x* level. Hybridization between the 4*x* forms resulted in artificial *B. juncea*. One instance of the direct appearance of artificial *B. juncea* from a cross between diploids was recorded. Artificial *B. juncea* was intermediate between the parent species and showed a close correspondence with the natural form. Cell size was considerably greater in newly synthesized *B. juncea* than in the natural species, but this difference was mostly eliminated after the former had been cultivated for a few generations. Fertility in the new artificial species was in most cases very low; continuous selection for four to five years raised the degree of fertility almost to that of the natural form. The seed yield of the best strains of synthesized *B. juncea* was about equal to that of good, nonbred local varieties, but the oil content was as a rule somewhat lower. The 18-chromosome hybrids were highly irregular meiotically, with $0–5_{II} + 8–18_{I}$. In the first generation, artificial *B. juncea* usually displayed meiotic disturbances, but by the fourth and fifth generations meiosis was markedly stabilized, although still not quite so regular as in the natural species. Crosses between artificial and natural *B. juncea* were readily effected, the hybrids being fully fertile. *B. juncea* (artificial or natural) ♀ x *B. campestris* ♂ gave rise, almost without exception, to 28-chromosome hybrids, the $F_1$ seeds being smaller than those of *B. juncea*. The reciprocal produced $F_1$ seeds of normal size from which 38-chromosome plants were raised. By crossing natural *B. juncea* as ♀ with *B. nigra*, four $F_1$ hybrids with 26 chromosomes and two with 34 were secured. Neither the reciprocal, nor crosses with *B. nigra* in which artificial *B. juncea* was used, resulted in any seeds.

4197 Olsson, G.
**Self-incompatibility and outcrossing in rape and white mustard.**
Hereditas, Lund 1960 : **46** : 241–52.

White mustard (*Sinapis alba*), turnip rape (*B. campestris* ssp. *oleifera*) and black mustard (*B. nigra*) are practically allogamous, whereas swede rape (*B. napus* ssp. *oleifera*) and brown mustard (*B. juncea*) are selfed to the extent of two-thirds of the seed set. The difference in mode of fertilization between the first three species on the one hand and last two on the other is not due to disparities in floral morphology but to differences in self compatibility. Further support was inferred for the author's view that allopolyploidy as such does not result in self compatibility [cf. XXIV, 2340].

4198 Olsson, G.
**Some relations between number of seeds per pod, seed size and oil content and the effects of selection for these characters in *Brassica* and *Sinapis*.**
Hereditas, Lund 1960 : **46** : 29–70.

Investigations were carried out chiefly on breeding material of swede rape, turnip rape and white mustard. According to data on rape, white mustard and synthesized *B. juncea*, no correlation existed between the seed yields of mother plants and those of the progeny plots. With respect to seed number per pod and 1000-seed weight, mother plants and progeny plots proved to be correlated. The correlation for the latter character was however only determined for spring swede rape. By continuous selection of white mustard for seed number per pod over a period of five years, the number was increased by positive selection by 1·33 ± 0·096 and decreased by negative selection by 1·51 ± 0·121, the seed number of the controls averaging 5·87. Mother plants and their progenies were correlated as regards oil content in winter and summer swede rape and white mustard. From crosses between summer and winter types within either swede rape or turnip rape, summer forms of each type with a higher oil content and oil yield than old varieties of the summer form were selected. $F_2$ segregation for summer *v.* winter habit in these crosses was in a 3 : 1 ratio. The rhythm of development was not however solely influenced by the locus summer *v.* winter habit. Continuous positive and negative selection of white mustard for oil content over five years increased the content to 33·94% and decreased it to 28·42% respectively, the control value being 30·87%. This increase was effected without any decrease in seed number per pod. The high-oil selection (Sv54/122) surpassed the mother variety Primex by an average of 8% in oil yield per ha. in 27 trials. Decrease in 1000-seed weight in white mustard tended to be

associated with increase in number of seeds per pod, and a significant negative correlation was detected between 1000-seed weight and oil content. Selection for low number of seeds per pod in white mustard resulted in a decline in pollen fertility. The oil content of white-mustard seed depended entirely on the genotype of the mother plant. Increase in seed size in autotetraploids of swede rape, turnip rape, *B. nigra*, *B. juncea* and white mustard was accompanied by reduction in oil content. Probably the lower oil content of the seeds of the 4*x* forms and of the larger seeds within 2*x* white mustard may be ascribed to an increase in cell size of the plants and the consequent effects upon the metabolism.

4199 Nicolau, A. & Dornescu, A.
Un soi bun de in de ulei pentru depresiunea Jijia-Bahlui. (**A good linseed variety for the Jijia-Bahlui depression**).
Stud. Cercet. ştii., Biol. Şti. agric. Iaşi 1959 : **10** : 321–24.

The variety Deta, bred by Doucet at Bucureşti, is recommended for the above area. In trials at Tîrgu Frumos, it yielded well, though exceeded by Domneşti.

4200 Atsmon, D.
**A lethal gene in the castor bean plant.**
J. Hered. 1959 : **50** : 302–04.

A mutant characterized by extremely shrunken and undeveloped cotyledons depended upon a single recessive gene.

4201 Lakiza, R. I.
**(The influence of environmental factors upon development of the sex characters in the castor oil plant).**
Fiz. Rasten. (Phys. Pl.) 1959 : **6** : 488–90. [Russian].

Growing the variety Kruglik 5 under 22 hr. days at Har'kov promoted the development of ♀ flowers, whereas 9 hr. photoperiods produced the opposite effect. Adequate moisture supply promoted the development of both ♂ and ♀ flowers, without altering the sex ratio, and improved the seed yield. N dressing promoted the development of ♂ flowers and shifted the sex ratio in favour of males, without however causing a reduction in the ♀ flowers; this treatment resulted in an appreciable improvement in seed yield.

4202 Nakamura, H.
**[Studies on sesame. V. On interspecific hybrids between the cultivated species (*Sesamum indicum* L.) and wild species with $2n = 32$ chromosomes].**
Hyogo Noka Daigaku Kenkyu Hokoku : Nogaku Hen/Sci. Rep. Hyogo Univ. Agric. : Ser. Agric. 1959 : **4** : 11–18. [Japanese].

Attempts to obtain hybrids between *S. indicum* ($2n = 26$), on the one hand, and *S. angolense*, *S. latifolium* and *S. prostratum*, on the other, are reported. Seed was set in crosses involving the two latter species. In the hybrid of *S. latifolium*, the modal chromosome configuration was $3_{II} + 23_{I}$; the corresponding value for the hybrid of *S. prostratum* was $7_{II} + 15_{I}$ and $8_{II} + 13_{I}$. In the *S. latifolium* cross, up to 2 trivalents were noted and, in the *S. prostratum* cross, up to 2 trivalents or $1_{IV} + 1_{III}$. It is inferred that *S. indicum* and *S. latifolium* have no genome in common while *S. indicum* and *S. prostratum* have 8 homologous chromosomes. The hybrids are vigorous and resistant to several diseases and pests affecting *S. indicum*; they are, however, highly sterile. [Cf. 3016].

4203 Arzumanova, A. M.
**(Selective fertilization in sesame and its utilization in hybridization).**
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Pl.-Breed.) 1958 : **31** : No. 3 : 263–71. [Russian].

Brief descriptions are given of the five forms used in the experiments, which consisted of pollination of each variety with different mixtures of pollen from the other varieties. The results showed that the variety Konditerskij 2058 [Confectionery 2058], when pollinated with a mixture containing pollen of Taškent 122, selected it, whereas in the absence of pollen of that variety it selected its own pollen. These two varieties showed close resemblances both morphologically and biologically. However, in the pollinations of Taškent 122 this variety selected its own pollen when present and only in its absence selected that of Konditerskij 2058; pollen from a Japanese variety, even when applied earlier, effected less pollination than self pollen. The Japanese pollen displayed a preference for its own pollen and that of Taškent 122 and other varieties adapted to Central Asia, where the experiments were performed.
The hybrid families obtained from pollen mixtures were more varied than those from

pollen of a single variety; some hybrids displayed greater earliness and some greater vigour. In the second generation very little segregation occurred and many families arising from the choice of self pollen showed greater vigour, greater branching and higher yield.

4204 Timariu, A.
Cercetări asupra cîtorva soiuri de floarea-soarelui la Statiunea Experimentală Agricolă Cîmpia Turzii. (**Researches on some sunflower varieties at the Cîmpia Turzii Agricultural Experimental Station**).
Probl. Agric., Bucureşti 1960 : **12** : No. 3 : 31–37.

Trials of four varieties introduced into Rumania from the USSR are reported, data being provided on yield, oil content and disease resistance.

4205 Deriščev, M. G.
(**Breeding and seed production of sunflowers at the Altaj branch of the Institute of Oil Plants**).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1959 : No. 3 : 16–18. [Russian].

Mention is made of several families of sunflower selected for short growth period and improved oil content from such varieties as VNIIMK 15636 [Oil Plants Institute 15636] and VNIIMK 8883.

4206 Nikolic-Vig [Nikolić-Vig], V.
Nuove pregevoli varietà di girasole nell'URSS. (**New outstanding sunflower varieties in the USSR**).
Sementi elette 1960 : **6** : No. 2 : 22–27.

A brief account is given of the Research Institute for Oil Crops at Krasnodar, reference being made to sunflower varieties produced there which have an oil content of 43–52%, combined with resistance to *Orobanche cumana* races A and B and yields of 35–38 c. per ha. of seed and 15–17 c. of oil. They mature three or more days earlier than the initial varieties.
An outline is given of the breeding method used in producing these varieties, two of which are now being tested in Yugoslavia.

4207 Kováčik, A.
Vplyv medziodrodovej hybridizácie na morfologické znaky u kríženco v slenčnice $F_1$ a $F_2$. (**The influence of intervarietal hybridization on morphological characters of $F_1$ and $F_2$ sunflower hybrids**).
Sborn. čsl. Akad. zeměd. Věd : Řada rostlinná Výroba 1960 : **33** : 447–66.

Crosses grew more quickly and extensively than their parents until the inflorescence developed whilst during the last stage of development the crosses were intermediate between their parents in height. The $F_1$ hybrids grew more than the $F_2$ hybrids in the last stage of development. Using a mixture of pollen from short-stemmed varieties, it was possible to get short progeny, and similarly long-stemmed hybrids were obtained by using pollen from long varieties. Pollen from the central region of the disc had an unfavourable effect on the height of the progeny. $F_1$ hybrids had a higher average number of leaves than the $F_2$ plants but did not exceed the parents in this respect. Also the $F_1$ plants had a leaf area greater than that of both parents or intermediate and this was also true for the average size of the inflorescence. In the $F_2$s the inflorescence was not larger than that of the parents.

4208 Kováčik, A.
Vplyv medziodrodovej hybridizácie na dĺžku a šírku prieduchov a na vel'kosť pel'ových zŕn u kríženco v slnečnice v generácii $F_1$ a $F_2$. (**The influence of intervarietal hybridization on length and width of stomata and on the size of pollen grains in the $F_1$ and $F_2$ in sunflower crosses**).
Pol'nohospodárstvo 1959 : **6** : 661–80.

A number of different crosses were studied. In the $F_1$s both length and width of stomata were greater than those of the parental varieties and in the $F_2$s these dimensions were intermediate between the parental values. Pollen grain size varied considerably, the mean values for the different crosses being either greater, intermediate or smaller in comparison with those of the parents. Pollen grains of early varieties were smaller than those of late varieties.

4209 Kováčik, A.
Príspevok o vplyve medziodrodovej hybridizácie na výnos, šupkatosť a olejnatosť semien slnečnice v generácii $F_1$ a $F_2$. (**A study of the effect of intervarietal hybridization on yield and the husk and oil content of sunflower seed in the $F_1$ and $F_2$**).
Pol'nohospodárstvo 1959 : **6** : 823–42.

The seed yield obtained from the $F_1$ generation was in most cases higher than that of both parents, the increase varying between 1 and 20%. Crosses of Stepnjak [sunflower from the Steppe] with Iregszemcse, Mezöhegyes and VNIIMK 6540 [Oil Plants Institute 6540] and

the variety Pioner Sibiri [Siberian Pioneer] gave particularly high yields. Most $F_2$ hybrids also showed an increase in yield, this being lower than that of the $F_1$ hybrids. The percentage of husk was intermediate between the parental values in most crosses but in some it was lower; the pollen parent exerted considerable influence on husk percentage. The oil content of the seed varied considerably but in some cases it exceeded that of the parents.

4210 Bogatova, M. G.
**(Plant resources in the sunflower and their importance for use as fodder).**
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Pl.-Breed.) 1958 : **31** : No. 3 : 254–62. [Russian].

Observations made in the vicinity of Leningrad on 14 Russian oil varieties and 2 silage varieties, together with 76 varieties of varied origin, showed the leaves of all of them to be rich in carotene, vitamin C and protein. The variety Gigant 549 [Giant 549] gave the highest yield of green matter, exceeding the oil variety VNIIMK 1646 [Oil Plants Institute 1646] by 35–96% with a yield of 751 c. per ha.; it is also less prone to disease than all other silage varieties and has a lower proportion of stem than those from the USA, Bulgaria, Asia and elsewhere. It is late in maturity and certain other types in the collection are recommended for selecting varieties suitable for producing silage in the early season and for northern latitudes. A number of others are mentioned as promising material for selecting late varieties resembling Gigant 549.

4211 Putt, E. D. & Sackston, W. E.
**Resistance of inbred lines and hybrids of sunflowers (*Helianthus annuus* L.) in a natural epidemic of aster yellows.**
Canad. J. Pl. Sci. 1960 : **40** : 375–82.

Resistance to aster yellows virus was dominant over susceptibility and appeared to be qualitatively inherited, possibly by a single gene. Resistance occurred in association with both resistance and susceptibility to rust. Of 15 lines resistant to leaf mottle, 13 were also resistant to aster yellows.

4212 **More root rot resistance.**
Agric. Res., Wash. 1960 : **8** : No. 11 : p. 15.

The new safflower variety US–10 is more resistant to *Phytophthora* root rot and more widely adapted than Gila. Except for its resistance to this disease, US–10 is almost identical with Nebraska 10. It was developed from a cross between Nebraska 10 and Western Oilseeds 14 (resistant), followed by six back crosses with Nebraska 10.

4213 Irwin, H. S. & Turner, B. L.
**Chromosomal relationships and taxonomic considerations in the genus *Cassia*.**
J. Amer. Bot. 1960 : **47** : 309–18.

All the chromosome numbers known for the genus, as the result of counts by the authors and other investigators, are listed. The basic number of the genus is considered to be $x = 7$, aneuploid numbers having arisen through chromosome loss at various euploid levels. The $x$ number of 8, of general occurrence in subsect. *Leiocalyx* of sect. *Chamaecrista*, is however presumed to have originated from the ancestral number of $x = 7$ by gain of 1 chromosome. Reasons are given against elevating sect. *Chamaecrista* to generic rank.

4214 Angulo Carpio, M. D.
Variaciones florales hereditarias en *Digitalis thapsi* obtenidas por medio de colchicina. **(Heritable floral variations in *D. thapsi* obtained by means of colchicine).**
Genet. iber. 1959 : **11** : 176–87.

Colchicine treatment has resulted in a number of floral abnormalities which have proved heritable.

4215 Werner, K.
Zur Nomenklatur und Taxonomie von *Digitalis* L. **(The nomenclature and taxonomy of *Digitalis* L.).**
Bot. Jb. 1960 : **79** : 218–54.

The nomenclature of *Isoplexis* and *Digitalis* is revised, several new combinations being suggested. Distinguishing characters of some taxa are set out in tabular form.

4216 **RRIM 600 series clones in estate trials.**
RRI Plant Bull. 1960 : No. 48 : 49–59.

A report is given on some results from the first two years of tapping in trials of the RRIM 600 series of rubber clones on estates in Malaya [cf. XXVII, 4289].

## FRUITS AND NUTS

**Annual Report of the East Malling Research Station, near Maidstone, Kent, 1st October, 1958 to 30th September, 1959/(1960) : Pp. 144.**

4217 *I. Pomology.* (*pp. 6–11*).
**Tree fruits.** Apple seedlings raised to produce late-flowering varieties were planted out. Also attempts are being made to produce early-maturing varieties and improved russets. Selection of mazzard seedlings with a view to developing disease-resistant dwarfing stocks for cherries has continued.
**Raspberry.** Of the seven genes known to govern resistance to *Amphorophora rubi*, $A_1$, derived from Baumforth A, confers resistance to strains 1 and 3 of the aphid and $A_2$ or the complementary genes $A_3$ and $A_4$ give high resistance to strain 2. Varieties resistant to all three strains are obtained by combining $A_1$ with $A_2$ or $A_3$. The three *A* genes have been transferred to inbred lines breeding more or less true for different seasons of fruiting. A fourth rare strain of *A. rubi* is known and hybrids resistant to the four strains have been bred. Hybrid families raised with the aim of transferring virus resistance from Newburgh to other lines differed markedly in the amount of infection visible after inoculation by aphids.
**Currants.** In breeding for improved strig characters, an allotetraploid of black x red currant was successfully selfed and back crossed to Baldwin. A sterile $F_1$ hybrid of Baldwin x *Ribes longeracemosum* produced fruit and seed after intensive treatment with colchicine, this being the first step in transferring strig characters from *R. longeracemosum* to the black currant. Back crossing of *R. multiflorum* to red currant was continued to obtain the strig characters of *R. multiflorum* in plants resembling red currant and capable of producing satisfactory $F_1$ seedlings in crosses with black currant. A search for resistance to *Phytoptus ribis* in *Ribes* species and hybrids is being carried out.
**Gooseberry.** A spineless triploid hybrid of 4*x* (black currant x gooseberry) x gooseberry has fruited and more back crosses to gooseberry were made.

4218 *VII. Plant pathology.* (*pp. 23–29*).
Apple and pear varieties were inoculated with *Erwinia amylovora*. The pear Laxton's Superb appeared to be less resistant than William's Bon Chrétien or Conference and amongst the apples Cox's Orange Pippin appeared more resistant than Spartan, MacIntosh and Winesap.
The mechanisms of resistance to *Verticillium* in hops and other plants were studied; the presence of suberin in the hypodermis appeared to contribute to resistance. There is some evidence that extreme differences in wilt resistance between species may be associated with differences in content of phenolic substances but intraspecific differences do not show such a relationship. The strawberry Talisman has shown high resistance to *V. albo-atrum* and *V. dahliae* and Cambridge Vigour relatively low resistance.

4219 *VIII. Entomology.* (*pp. 30–33*).
One hundred seedlings of Cox's Orange Pippin x Northern Spy found to be highly resistant to *Eriosoma lanigerum* in 1958 have maintained their resistance.

4220 *Beakbane, A. B. & Laberne, M. V. The performance of some virus-tested loganberry clones.* (*pp. 48–51*).
The five clones tested showed differences in vigour, method of flower insertion in the inflorescence, fruit size and susceptibility to frost. The clones 460/2 and 463/3 appeared to be most promising.

4221 *Knight, R. L. & Keep, E. The genetics of suckering and tip rooting in the raspberry.* (*pp. 57–62*).
In crosses between *Rubus occidentalis* and *R. idaeus*, tip rooting was found to be controlled by a dominant gene, *Tr*, and suckering by a recessive gene $sk_1$. Some results published by Colby [cf. VII, 306] are interpreted. It is suggested that *R. idaeus* var. *strigosus* may in addition carry the genes $sk_2$ and $sk_3$ and that, when these are both present in the homozygous condition in $Sk_1$ $sk_1$ plants, suckering becomes possible. When the *Tr* gene is transferred from *R. occidentalis* to *R. idaeus*, the latter can be propagated by tip layering and leaf-bud cuttings as well as by suckers.

4222 Kekuh, A. M.
**(An eminent pomologist, L. P. Simirenko).**
Agrobiologija (Agrobiology) 1959 : No. 3 : 469–74. [Russian].
This biography of the late Ukrainian horticulturist lists some recent varieties of fruit trees and soft fruits bred at Mleevo and describes an older apple variety, Simirenko Reinette, which is characterized by late maturity, high yield and good keeping quality.

4223 Evtušenko, A. F.
**(Horticulture in Bulgaria).**
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1959 : No. 5 : 103–06. [Russian].

Mention is made of eight new plum varieties, differing in fruit shape, maturation date and yield, which have been selected from Vengerka Kjustendil'skaja [Kjustendil' prune] at the Trojan research station. Also mentioned are four new raspberry and three strawberry cultivars from the Central Horticultural Institute at Kostinbrod, Sofia province. The raspberries are superior in quality and yield to Marlborough and the strawberries are better in these respects than Madame Moutot.

4224 Kobel, F. & Schütz, F.
Neue Erdbeer- und Himbeersorten der Eidgenössischen Versuchsanstalt Wädenswil. **(New strawberry and raspberry varieties of the Federal Experiment Station, Wädenswil).**
Schweiz. Z. Obst- u. Weinb. 1960 : **69** : 249–53.

**Raspberry.** EVA 1 [Federal Experiment Station 1] is derived from the cross Williamette x Andenken an Paul Camenzind [Souvenir of Paul Camenzind]. It has large fruit similar in form and colour to that of Andenken an Paul Camenzind. The sugar : acid ratio of the fruit is satisfactory and the aroma moderately strong; the fruit is transportable and suitable for freezing. Heat damage has not been observed. The canes have overwintered well even under particularly cold conditions. EVA 2 (Rote Wädenswiler [Red Wädenswil] x Willamette) is another variety with large fruit suitable for freezing; the roundish, dark-red fruit is mostly sweet and very aromatic. The fruit is transportable and easily picked. Heat damage has not been observed. The canes are particularly strong and tall.

**Strawberry.** The new strawberry Wädenswil 6 is a productive large-fruited variety. The flesh is of high quality, having a fine flavour and marked aroma; it is very juicy, rather soft and red in colour throughout. Its transportability is not satisfactory and therefore the fruit should be supplied directly to the customer. The vigorous plants are resistant to leaf spot and the flowers are hermaphrodite. Wädenswil 6 is a cross between the two breeding lines 49/340 and 46/86.

4225 Hilkenbäumer
Professor Erich Maurer Berlin zum 75. Geburtstag. **(Professor Erich Maurer, Berlin, on his 75th birthday).**
Z. Pflanzenz. 1959 : **42** : 205–07.

A biographical note is given on E. M. Maurer who has done much work on breeding fruit-tree rootstocks.

4226 Ostapenko, V. I.
**(Some distant stone-fruit hybrids by Academician P. N. Jakovlev).**
Agrobiologija (Agrobiology) 1959 : No. 3 : 371–77. [Russian].

Sloe x apricot, *Prunus triflora* x peach and most other hybrids obtained by the late Jakovlev from wide crosses at Mičurinsk were usually sterile and tended towards matrocliny. Fertile hybrids such as *P. besseyi* x sloe and *P. besseyi* x *P. tomentosa* were exceptions. The tendency toward matrocliny was strong in most hybrids and in some cases such as *P. besseyi* x peach it could be only partially overcome by back crossing to peach. A few hybrids such as *P. besseyi* x *P. tomentosa* were intermediate while others, in particular *P. besseyi* x sloe, resembled the pollen parent more closely. Varied degrees of mixed, fused and swamping inheritance was observed in young hybrids, the variability in the combination of the characters of the parental species being considerable. This variability was greatly influenced by external conditions. For instance, hybrids of sloe x apricot and almond x peach had at first morphological characteristics of the pollen parent, but gradually bore increasingly stronger resemblance to sloe or almond respectively. Some hybrids had characteristics absent in both parents, as in a hybrid of *P. besseyi* x apricot. The progeny from open pollination of the hybrids was found to bear greater likeness morphologically to the parental species which was better adapted to the conditions of Mičurinsk, resembling almond in the case of open-pollinated almond x peach seedlings and sloe in *P. besseyi* x sloe. Some seedlings developed characteristics of species other than those used in the initial cross. Comparative studies of the reproductive organs of the $F_1$ of distant hybrids showed that in matroclinous forms these developed normally, while in the $F_1$ of the intermediate type various anomalies of the following kinds occurred: absence of pistils, deformed pistils, stamens or anthers, sterile pollen and pollen with reduced viability. In addition to the above anomalies intermediate hybrids were characterized by abnormal development of the fruit, low viability and lack of

vigour of the seedlings. Most distant hybrids showed reduced fertility or were completely sterile; exceptions were provided by hybrids of *P. besseyi* x *P. tomentosa* and almond x apricot which were normally fertile. Hybrid fertility was positively correlated with ease of crossing of the initial species.

4227 Meza, N. & Manughevici, E.
Soiuri locale de mere şi pere de iarnă cultivate în regiunea Hunedoara. (**Local varieties of winter apples and pears grown in the Hunedoara region**).
Grădina Via Livada 1959 : **8** : No. 5 : p. 41. (Abst.).
Some of the more important varieties from this part of Rumania are listed. They are of interest on account of their productivity and resistance to frost and diseases.

4228 Meza, N. & Manughevici, E.
Soiuri locale de mere şi pere de iarnă cultivate în regiunea Hundeoara. (**Local varieties of winter apples and pears grown in the Hunedoara region**).
Grădina Via Livada 1960 : No. 2 : 43–46.
Pomological descriptions are given of 10 apple and 2 pear varieties from the above Rumanian region. Some of the apples are regarded as promising for breeding on account of their quality or productivity.

4229 Pratt, C.
**Changes in structure of a periclinal chromosomal chimera of apple following X-irradiation.**
Nature, Lond. 1960 : **186** : 255–56.
Periclinal chimeras with one diploid layer (designated 2–4–4–4) were induced by X irradiation of scions of a 2–2–4–4 chimera of Giant Spy (Loop) at the New York State Agricultural Experiment Station, Geneva. Since 2–4–4–4 chimeras produce diploid gametes, this technique may prove valuable in breeding polyploid apples. Probably such an alteration in constitution arises as a result of shifting of layers during reorganization of the shoot apex after radiation damage and not through induced changes in chromosome number.

4230 Bishop, C. J.
**Radiation-induced fruit color mutations in apples.**
Canad. J. Genet. Cyt. 1959 : **1** : 118–23.
Dormant apple scions were irradiated with 3000–5000 r. of X rays or 3·9–15·6 x $10^{12}$ thermal neutrons per cm.$^2$ and grafted into adult trees. The varieties used were Yellow Bellflower, Cortland, Sandow, Golden Russet, Macoun and Secor. A high rate of sectoring in skin colour was induced in Cortland and two completely dark-red sports were obtained. No colour change was observed in Yellow Bellflower, Macoun or Secor. In Sandow two cases of mutation to less colour and increased russeting were noted. The variety Golden Russet showed a large number of fruit variations, mostly with reduced russeting but occasionally with a red colour. In this variety changes in fruit colour were associated with shoot bifurcations, one half producing normal and the other half mutant fruits.

4231 Oprea, Ş. & Polacsay, R.
Comportarea cîtorva hibrizi de măr de perspectivă obţinuţi la Staţiunea experimentală hortiviticolă Cluj. (**The behaviour of promising apple varieties obtained at the Cluj Horticultural and Viticultural Experimental Station**).
Grădina Via Livada 1959 : **8** : No. 5 : p. 40. (Abst.).
Three promising hybrids are described: 1138, (Jonathan x Senator) grown on Calville de zăpadă [Snow Calville] as a mentor stock; 1092, Pearmain x Jonathan; and 1964, (Frumos galben [Yellow Beauty] x Jonathan + Red Delicious) grown on Jonathan as a mentor stock. All hybrids have fruit of good quality and high sugar content. The first two are resistant to *Fusicladium* and mildew.

4232 Parnia, P.
Comportarea unor soiuri autohtone în şcoală de puieţi. (**The behaviour of some indigenous varieties in the propagation nursery**).
Grădina Via Livada 1959 : **8** : No. 5 : p. 44. (Abst.).
Some north Moldavian apples have been found to provide readily propagated rootstocks in experiments at Fălticeni in 1958.

4233 Nesterov, Ja. S.
(**The setting of flowers and the differentiation of the floral parts in apple trees**).
Fiz. Rasten. (Phys. Pl.) 1959 : **6** : 176–82. [Russian].
Information on the dates of differentiation of the flower primordia and setting of the flower for 23 apple varieties studied at Majkop is provided.

4234 Kočetov, S. P.
**(Apples without seed).**
Priroda (Nature), Leningrad 1960 : No. 2 : 105–06. [Russian].
Trees belonging to five different varieties are reported to produce fruits from vegetative tissues in the province of Rostov and in the Krasnodar territory. The fruits are seedless.

4235 Säkö, T. J.
Omenien varastoimiskokeiden tuloksia. **(Results of storage experiments with apples).**
Koetoiminta ja Käytäntö 1959 : **16** : p. 16.
Comparative data are given for the keeping qualities of five varieties under different conditions of storage in Finland, on the basis of percentage loss in weight. Lobo has the longest keeping qualities; Wealthy is satisfactory until January.

4236 Nesterov, Ja. S.
**(Apple varieties for preparing dried fruit).**
Sad i Ogorod (Gdn. & Veg. Gdn.) 1960 : No. 2 : 57–58. [Russian].
Apple varieties which gave a high-quality dried product in tests at Majkop are listed.

4237 Groza, T.
Observaţii asupra rezistenţei la ger a unor soiuri de măr cultivate pe valea Şomuzului-Fălticeni. **(Observations on the resistance to frost of some apple varieties cultivated at Fălticeni in the Şomuz valley).**
Grădina Via Livada 1958 : **7** : No. 12 : 21–25; and 1959 : **8** : No. 5 : p. 42. (Abst.).
Of the six varieties tested, Patul was most resistant to the injurious effects of air frost.

4238 Morettini, A.
William Precoce Morettini (William x Citron des Carmes). [**Morettini's Early William (William x Citron des Carmes)**].
Riv. Ortoflorofruttic. ital. 1960 : **44** : 3–9.
A further description is given of a pear variety already described [cf. 720].

4239 Cojocaru, S. I.
Soiuri autohtone de pere cultivate la Nicoreşti. **(Indigenous varieties of pears cultivated at Nicoreşti).**
Grădina Via Livada 1959 : **8** : No. 1 : 39–42.
Pomological descriptions are given of the two local pears Rumenite de vară [Summer Red] and Gîtuite de vara [Summer Constricted]. These are thought to merit more extended cultivation on account of their high yield, quality and hardiness.

4240 Liacu, A., Mitu, M., Cireaşă, V., Roşu, F. & Duman, A.
Studiul comportării cîtorva soiuri autohtone de păr în pepinieră. **(A study of the behaviour of some indigenous pear varieties in the nursery).**
Grădina Via Livada 1959 : **8** : No. 5 : 41–42. (Abst.).
A study of 38 local Rumanian varieties from the regions of Măcin, Huşi, Iaşi and Tîrgu Neamţ showed that they were generally characterized by compatibility with quince stocks and productivity.

4241 Mitu, M.
Observaţii asupra creşterii altoilor de păr în pepinieră. **(Observations on the growth of pear scions in the nursery).**
Grădina Via Livada 1960 : No. 2 : 40–43. [Cf. 3095].

4242 Blaja, D.
Dezvoltarea partenocarpică a perelor Untoasă Liegel şi Untoasă Bosc. **(Parthenocarpic development in the pears Beurré Liegel and Beurré Bosc).**
Grădina Via Livada 1959 : **8** : No. 2 : 29–31.
Emasculated and bagged flowers of the above varieties set 26·6 and 15·5% fruits respectively under Rumanian conditions.

4243 Lefter, G.
Comportarea unor soiuri de păr faţă de atacul ciupercilor *Mycosphaerella sentina* (Fuck) Schroet şi *Endostigme pirina* (Aderh) Sydow. [**The behaviour of some pear varieties in response to infection by the fungi *M. sentina* (Fuck.) Schroet. and *E. pirina* (Aderh.) Sydow**].
Grădina Via Livada 1959 : **8** : No. 2 : 38–41.
In tests at the Geoagiu experimental station, Rumania, Curé, Decana de iarnă (= Doyenné d'Hiver), Fondată de pădure (= Fondante des Bois), Georges Boucher and Untoasă Liegel (= Beurré Liegel) were most resistant to *M.*

*sentina*, while Timpurie de Trevoux [Trevoux Early], Untoasă Hardy (= Beurré Hardy), Bergamoute Esperen (= Bergamotte Esperen), Olivier de Serres and Alexandru Lucas (= Alexandre Lucas) were resistant to *E. pyrina*. Resistance to these two fungi appears to be negatively correlated; some varieties, however, which show moderate resistance to both are listed.

4244 Kerzner, E. L. & Džadža, N. B.
**(Expanding quince orchards).**
Sad i Ogorod (Gdn. & Veg. Gdn.) 1960 : No. 2 : 31–32. [Russian].
An expansion of the area under quinces in Stalingrad province is advocated, especially as new winter-hardy varieties are now available. Some varieties, including 22/13, 31, 41/6, 42/11, 45 and 65, which make high quality preserves, are listed.

4245 Stanciu, G.
Comportarea unor sîmburoase în cîmpia Banatului. **(The behaviour of some stone fruits in the plain of Banat).**
Grădina Via Livada 1959 : **8** : No. 12 : 49–53.
Varietal trials of peach, apricot and sweet and sour cherries at the Lovrin experimental station are reported. Data are provided on yield and frost resistance for the peaches and apricots, and on yield and vegetative period for the cherries.

4246 Blommaert, K. L. J. & Hurter, N.
**Growth response of physiologic dwarf seedlings of peach, apricot and plum to gibberellic acid.**
S. Afr. J. agric. Sci. 1959 : **2** : 409–10.
Seedlings raised from unstratified, freshly harvested seeds from which the testa had been removed were treated with gibberellic acid three weeks after the seeds had been put out to germinate. The seedlings grew satisfactorily. The replacement of 2–3 months' stratification at low temperature by gibberellic acid treatment may therefore offer a means of saving time in breeding.

4247 Fair, E. W.
**Improved apricot varieties.**
Amer. Fruit Gr. 1960 : **80** : No. 3 : p. 50.
The release of the new varieties Utah 18, 27 and 32 by the Utah Agricultural Experiment Station is announced. Utah 18 is a late-ripening apricot similar to Chinese. Utah 27 is described as an attractive, moderately firm, good-quality apricot. Utah 32 ripens eight days after Chinese and in quality has surpassed all other varieties.

4248 Tupicyn, D. I.
**(The apricot varieties grown in eastern China).**
Vestn. sel'skohozjajstv. Nauk (Rep. agric. Sci.) 1959 : No. 6 : 123–25. [Russian].
Descriptions are given of nine varieties of hybrid origin which differ in leaf shape and colour from the apricots of Europe and the Middle East. It is proposed to classify them as *Armeniaca vulgaris* ssp. *sinensis*. Most have large attractive fruits of good flavour which transport well; they are regarded as valuable for immediate introduction or breeding purposes in the USSR. One of these varieties, Mai-huang-hsing, proved resistant to rust in introduction trials at Majkop.

4249 Constantinescu, N., Popa, P. & Micu, I.
Comportarea soiurilor de prun în condiţiile zonei de silvostepă. **(The behaviour of plum varieties under the conditions of the woody-steppe zone).**
Grădina Via Livada 1959 : **8** : No. 5 : p. 43. (Abst.).
Varietal trials at the Istriţa experimental station, Rumania, are reported.

4250 Burmistrov, A. D.
**(Some results of studying Mičurin plums under the conditions of the Latvian SSR).**
Latv. PSR Zināt. Akad. Vestis 1959 : **5** : 155–62. [Russian].
Renklod Kolnoznyj [Kolhoz gage], Renklod Ternovyj [Sloe gage] and Renklod Severnyj [Northern gage] were hardier and more productive than several Latvian standard varieties. Renklod Kolhoznyj was 10 days earlier than Latvijskaja Želtaja [Latvian Yellow] and Renklod Ternovyj much later.

4251 Breviglieri, N.
La susina precoce "Morettini 355". **(The early plum Morettini 355).**
Riv. Ortoflorofruttic. ital. 1960 : **44** : 10–12.
The plum described is a hybrid of Florenzia x Beauty. It is self sterile. Its fruits, which are red, larger than those of Beauty, heart-shaped, firm and aromatic, ripen soon after those of Florenzia and before Mirabella precoce [Early Myrobolan].

4252 Cazacu, I.
Comportarea soiurilor de prun în stepă. (**The behaviour of plum varieties in the steppe**).
Grădina Via Livada 1959 : **8** : No. 2 : 26–29.
Information is provided on the vegetative cycle of the more important varieties grown in the Rumanian steppe.

4253 Keszi-Harmath, E.
Polenizatori buni pentru prunul Tuleu gras. (**Suitable pollinators for the Tuleu gras plum**).
Grădina Via Livada 1959 : **8** : No. 6 : 46–47.
Suitable varieties for pollinating the above male-sterile variety have been determined in experiments at the Cluj agronomic institute, Rumania.

4254 Săvescu, A. & Isac, G.
Contribuţii la studiul biologiei şi combaterii viespei negre a prunelor (*Hoplocampa minuta* Christ). (**Contributions to the biological study and combating of *Hoplocampa minuta* Christ**).
Grădina Via Livada 1959 : **8** : No. 5 : 57–58. (Abst.).
Late-flowering plum varieties such as Anna Späth are less seriously attacked by this pest in Rumania than early-flowering varieties.

4255 Neagu, M. I. & Georgescu, M.
Tipuri noi de cireş obţinute prin fecundare liberă de la soiurile pietroase de Cotnari şi Germersdorfer. (**New types of cherry obtained by open pollination of the varieties Cotnari Bigarreau and Germersdorf**).
Grădina Via Livada 1959 : **8** : No. 5 : p. 40. (Abst.).
Seedlings obtained by the above method at the Istriţa research station, Rumania, have been selected for fruit quality and resistance to drought.

4256 Williams, W. & Gale, J. S.
**Effect of selection on the frequency of genotypes determining incompatibility in *Prunus avium*.**
Nature, Lond. 1960 : **185** : 944–45.
Analysis of the frequency of alleles at locus *S* in cultivars of *P. avium* indicated that allele $S_3$ possessed a selective advantage [cf. XXVII, 2170]. Since gametic selection does not appear to occur and since heterozygosity at *S* is obligatory, it is of interest to inquire whether selection favours certain genotypes showing interallelic interactions, quite apart from the individual alleles they contain. The upper limit of probability calculated strongly suggests that the observed frequency is attributable to selection of genotypes and that certain combinations of alleles, in particular $S_1S_3$, $S_2S_3$ and $S_1S_2$, have been favoured in the course of the improvement of the sweet cherry.

4257 Bargioni, G.
Contributo allo studio delle cultivar di ciliegio della provincia di Verona. (**Contribution to the study of the cherry cultivars of the province of Verona**).
Riv. Ortoflorofruttic. ital. 1960 : **44** : 103–28.
An account is given of cherry cultivation in the Verona province of northern Italy. Descriptions are given of five of the main local cultivars with information on times of flowering and ripening, germination of pollen in artificial media, self and cross compatibility and fruit quality. All five proved self incompatible and suitable pollinators are indicated for each. The cultivar known as Durona di Verona (= Mora di Cazzano) is considered superior to the other four.

4258 Maškin, C. I.
(**Study of the viability of pollen and stigma of flowers developing on cut branches**).
Bot. Ž. (Bot. J.), Moskva 1960 : **45** : 547–51. [Russian].
When cut branches of *Cerasus vulgaris, Prunus besseyi, Acer platanoides, Corylus avellana* and *Padus racemosa* were kept in water in the laboratory, the flowers that formed produced pollen of high viability, which varied from 71·9% in *P. racemosa* to 98·1% in *P. besseyi*. After storage in parchment bags in a desiccator with $H_2SO_4$, the viability of the pollen of *P. besseyi* fell to 32·2% after two months and 5·9% after three. Pollen from cut branches of *C. vulgaris* 'Gremjačenskaja' produced a set of 3 ripe fruits from 50 flowers of *Cerapadus* as against 6 from pollen collected from the tree. The stigma was shown to be mature and ready for pollination in the flowers of the cut branches in all the above species by pigmentation with $K_2MNO_4$. In oak however the pistils did not mature.

4259 Rjadnova, I. M. & Čebotaeva, T. F.
**(Local varieties of sweet cherry in the Krasnodar territory).**
Agrobiologija (Agrobiology) 1959 : No. 3 : 463–64. [Russian].
Černyj Almaz 1734 [Black Diamond 1734], Černoglazka 1562 [Black-eyed 1562], Agatovaja 1560 [Agate 1560] and Oksana 1561 have been selected from local material at the Krymsk Breeding Station. They have a high sugar content, flesh of crunchy consistency, and resistance to weevil, bacterial rot and mechanical injury in transport.

4260 Mihăescu, G.
Comportarea unor soiuri de piersic în zona orașului București. **(The behaviour of some peach varieties in the vicinity of the town of București).**
Grădina Via Livada 1959 : **8** : No. 1 : 33–39.
This report of trials of mainly introduced varieties provides data on vegetative cycle, resistance to frost, *Taphrina deformans, Ascospora beijerinckii, Sclerotinia* sp. and aphid, and yield.

4261 **A royal peach.**
Amer. Fruit Gr. 1960 : **80** : No. 4 : p. 50.
Royalvee, a semiclingstone, early-ripening peach, has been released by the Horticultural Experiment Station, Vineland, Ont. The medium-sized fruits are bright red all over, with good quality. The variety has hardy buds and the ability to set fruit under adverse conditions.

4262 Hinrichs, H. A.
**Goldenred: a new, high quality yellow freestone peach.**
Bull. Okla. agric. Exp. Sta. 1960 : No. B–542 : Pp. 7.
Detailed information is given on this yellow-fleshed freestone variety which originated from Early Elberta x Halehaven and is resistant to bacterial spot (*Xanthomonas pruni*) [cf. XXIX, 673].

4263 Fregoni, M. & Ricci Bitti, G.
Effetti di basse temperature invernali sui pescheti dei dintorni di Piacenza. **(Effects of low winter temperatures on the peach groves of the environs of Piacenza).**
Ann. Fac. Agr., Milano 1959 : **76** : 209–34.
The damage caused by the exceptionally cold spell in February 1956, where minimum temperatures of —16·6° C. were reached, is described. The cultivars least effected were Aurora and Hale.

4264 Džanelidze, V. S. & Razmadze, E. G.
**(First results of the state varietal testing of citrus fruits).**
Sad i Ogorod (Gdn. & Veg. Gdn.) 1960 : No. 2 : 28–31. [Russian].
An account of recent Georgian trials of 18 orange, 12 mandarin and 9 grapefruit varieties is given. Among orange varieties with high yields, the Soviet cultivar Pervenec [First-born] was distinguished by its winter hardiness. Unshiu Širokolistyj [Broad-leaved Unshu (= Satsuma)] was the best cropper among the mandarins, while Skorospelka [Early] was the earliest. Marš Bessemjannyj [March Seedless] and Natsumikan are stated to be the most productive grapefruit varieties.

4265 Sacco, T.
Ricerche sul *Citrus aurantium* L. della Somalia. **(Researches on *C. aurantium* L. in Somaliland).**
Riv. Agric. subtrop. 1960 : **54** : 100–05.
The main types of bitter orange grown in Somaliland are described and illustrated.

4266 **(Spontaneous polyploids of *Poncirus trifoliata*).**
Senshokutai (Chromosome)/Kromosomo 1960 : **35** : 1444–46. [Japanese].
Morphological and cytological descriptions are given of some triploids and tetraploids discovered in a batch of seedlings from diploid mother plants.

4267 Basso, M.
Contributo allo studio delle cultivar di fico della provincia di Pisa. **(Contribution to the study of the fig cultivars of the province of Pisa).**
Riv. Ortoflorofruttic. ital. 1960 : **44** : 46–66.
Descriptions are given of 16 cultivars, six being varieties bearing twice a year, the others bearing only one main crop. The best varieties are considered to be Dottato, Verdino, Gentile bianco [Noble White] and Piombinese.

4268 Fosberg, F. R.
**Introgression in *Artocarpus* (Moraceae) in Micronesia.**
Brittonia 1960 : **12** : 101–13.
A discussion is given of the nomenclature and taxonomy of members of the genus *Artocarpus* occurring in Micronesia, principally concerning *A. altilis* and *A. mariannensis*. Variants are described which are interpreted as the result of introgression between these two species.

Although *A. altilis* is usually seedless, seed-bearing varieties and occasional seeds in otherwise seedless varieties are known to occur. Furthermore, some evidence that this species may produce viable pollen is available. Hybridization between the two species in either direction may therefore be counted as a possibility. Man's influence in transporting the parents and progeny over the very considerable distances between the islands and in modifying the hybrid populations is discussed.

4269 Rizzotto, N.
Noce "Feltrina": pianta da salvare! **(The Feltre walnut, a plant that should be saved).**
Agricoltura d. Venezie 1960 : **14** : 142–49.

The walnuts of the district of Feltre in the Veneto province of northern Italy have been famed for their quality from time immemorial and the cultivar is described. It has smooth nuts with an exceptionally high kernel percentage. Since its properties are transmitted to its seedlings efforts are now being made to select pure stocks of improved planting material.

4270 Blaja, D. & Pandele, I.
Alegerea celor mai bune exemplare de nuci din bazinul Bistriţa. **(Choosing the best examples of walnuts in the Bistriţa basin).**
Grădina Via Livada 1959 : **8** : No. 5 : p. 42. (Abst.).

Four selections, superior in such characters as productivity, nut quality and resistance to frost, drought and diseases, have been picked out from 700 samples studied in the above region of Rumania.

4271 Ichii, T.
**(On the propagation of chestnuts by layering. II. The rooting capacity of some cultivated varieties).**
Engei Gakkai Zasshi/J. hort. Ass. Japan 1959 : **28** : 183–87. [Japanese].

A table is given showing the relative ease of rooting of layers of a series of oriental chestnut varieties grown in Japan. Rooting could be considerably improved by hormone treatment.

4272 Graves, A. H.
**Some outstanding new chestnut hybrids I.**
Bull. Torrey bot. Cl. 1960 : **87** : 192–204.

At the Connecticut Agricultural Experiment Station, breeding for resistance to chestnut blight (*Endothia parasitica*) by hybridization of American with Chinese and Japanese species [cf. XXI, 2129] has resulted in a number of promising hybrids. Botanical descriptions are given of three of these.

The Essate-Jap chestnut of [(*Castanea crenata* x *C. pumila*) x *C. crenata*] x *C. crenata* parentage is an erect, fast-growing, early variety, flowering during June 1–15 with nuts ripening during September 5–20 in latitude 41°. The nuts have a slightly bitter flavour but are quite sweet when boiled.

The Sleeping Giant chestnut which was developed from [*C. mollissima* x (*C. crenata* x *C. dentata*)] is of spreading habit, late blooming and moderately productive. The nuts are large and glossy and are said to be of passable flavour when well cured. It is completely blight-resistant and should make good timber stock when grown in close formation.

The Kelsey chestnut was developed by crossing *C. mollissima* with a hybrid plant of doubtful parentage; Miracle and *C. mollissima* are suggested as the most likely parents. This variety is primarily a nut tree; the nuts are said to be small but delicious, the inner skin separating readily to disclose a sweet yellow kernel. The tree is extremely blight resistant.

4273 Stanciu, G.
Soiuri valoroase de alun pentru plantaţii de producţie. **(Hazel varieties of value for productive plantations).**
Grădina Via Livada 1958 : **7** : No. 11 : 35–39.

An account is given of the yield, fruit size and shape, and maturation period of 20 local forms selected at the Lovrin experimental station.

4274 Crescimanno, F. G.
Ricerche sulla biologia fiorale di alcune cultivar di mandorlo premici coltivate in Sicilia. **(Investigations on the floral biology of some tender almond cultivars grown in Sicily).**
Riv. Ortoflorofruttic. ital. 1960 : **44** : 13–23.

In continuation of earlier studies [XXIII, 2961], data are presented for six Sicilian cultivars of soft-shelled almonds in respect of time of flowering and ripening, fertility and the characteristics of the fruit. Three were self sterile, Mollisona gave a 6·06% set when selfed and the rest gave well under that amount and benefited by cross pollination. Suitable pollinators are indicated. The percentage of kernel was 64% in the variety Pistacchio and varied from 37 to

56% in the others, whereas in Avola scelta [Selected Avola], the best of the hard-shelled varieties Raman, V.S., it was 22%.

4275 Raman, V. S.
**Studies in the genus *Arachis*: IX. A fertile synthetic tetraploid groundnut from the interspecific backcross, *A. hypogaea* x (*A. hypogaea* x *A. villosa*).**
Indian Oilseeds J. 1960 : **4** : No. 2 : 90–92.
The single allotetraploid ($2n = 40$) obtained from the back cross of the allotriploid of *A. hypogaea* x *A. villosa* as ♂ was fertile, with some of the desirable features of *A. villosa* [cf. 757]. Its origin is ascribed to fusion between two 20-chromosome gametes. The ♂ gamete, it is suggested, had a B genome of 10 chromosomes from *A. hypogaea* and 10 chromosomes from the A genome of *A. hypogaea* and $A^1$ genome of *A. villosa*. When open pollinated, the allotriploid gave rise to one hexaploid whose origin is attributed to fertilization of an unreduced egg by an unreduced ♂ gamete from the allotriploid.

4276 Sangave, R. A., Chavan, V. M., Gadre, G. V. & Gupte, A. K.
**Groundnut improvement in the Bombay Deccan.**
Indian Oilseeds J. 1960 : **4** : No. 1 : 23–25.
Karad 4–11, a spreading type developed by single-plant selection at the Agricultural Research Station, Karad, is superior to the local type in yield, shelling outturn and oil content.

4277 Thirumala Rao, S. D. & Murti, K. S.
**Compositional studies of Indian groundnuts: Part II - South Indian groundnuts.**
Indian Oilseeds J. 1960 : **4** : No. 1 : 4–14.
An analysis of local and improved TMV varieties grown in Andhra and Madras is reported from the Oil Technological Institute, Anantapur.

4278 Bhavanishanker Rao, M. & Raman, V. S.
**Studies in the genus *Arachis*: VIII - Note on classification of groundnuts.**
Indian Oilseeds J. 1960 : **4** : No. 1 : 15–16.
As the result of observations on introductions at the Agricultural Research Institute, Coimbatore, it is suggested that types representing new combinations of the characters of semispreading habit with red or purple testa should be added as subgroups to the semispreading category in the classification given by John *et al.* [cf. XXV, 2352].

4279 Chandrasekharan, N. R., Ramachandran, M., Krishnaswamy, P. & Raman, V. S.
**Studies on exotic varieties of groundnut.**
Indian Oilseeds J. 1960 : **4** : No. 2 : 57–61.
A brief account is given of the agronomic characters of 162 types from ten foreign countries, as observed at the Agricultural Research Station, Tindivanam, Madras.

4280 **Breeding trials on coconut.**
Statist. News Lett. 1959 : **9** : No. **3** : 12–13.
Information is given on the design of experiments begun in India to study (1) the open-pollinated progeny performance of selected mother palms at three centres and (2) crosses between selected tall Pilicode mother palms and dwarf males at one centre.

4281 Rudkovskij, G. P.
**(Cornelian cherry in the Ukraine).**
Priroda (Nature), Leningrad 1960 : No. 5 : 101–02. [Russian].
The large-fruited, high-yielding, frost-resistant varieties 969 and 1918 of *Cornus mas* were bred at the Botanic Garden in Kiev. The fruits have a dry-matter content of 16–17% and good flavour.

4282 Stepanova, E. M.
**(Vitamins in fruits and berries).**
Priroda (Nature), Leningrad 1960 : No. 5 : 96–98. [Russian].
The vitamin contents of the fruit in raspberry, currants, gooseberry, *Rosa*, *Hippophae*, strawberry and *Sorbus* were studied at the All-Union Vitamin Institute and some varieties and forms which are particularly rich in vitamins are listed.

4283 Haskell, G.
**Role of the male parent in crosses involving apomictic *Rubus* species.**
Heredity 1960 : **14** : 101–13.
The three pseudogamous species *R. procerus*, *R. laciniatus* and *R. calvatus* were pollinated by their own pollen and by *R. nitidioides*. Apomictic progenies obtained from the first two species by "selfing" were less vigorous than the corresponding "crosses" from pollinations with *R. nitidioides*. *R. laciniatus* was pollinated by a polyploid series of apomictic species. Compared with seeds from selfing, germination of seeds from cross pollination improved, the germination percentage increasing with the

degree of ploidy of the pollen parent. Pollination by the sexual diploid *R. ulmifolius*, however, was associated with the highest germination percentages. In general, apomictic seedlings of *R. laciniatus* from selfing were less vigorous than those from interspecific cross pollinations. This stimulation of "pseudogamous vigour" by the latter varied with the pollen source, being affected by the degree of polyploidy of the ♂ or by genetic differences between pollinating species having the same chromosome number. The pollen parent affected seed shape in *R. laciniatus*. Seed length and breadth were correlated for most pollinations, but self pollination may reduce the correlation, by leading to an increase in the variation for seed shape, particularly length. This effect was attributed to the sexuality of the endosperm believed to be characteristic of pseudogamous *Rubus* spp., the increased variation representing segregation among the sexually formed endosperms. The genetic constitution of these endosperms affects the vigour of the apomictic offspring, often leading to "pseudogamous heterosis". The occurrence of sexuality in *R. laciniatus* was tested by pollinations with 11 British species. The conclusion that the frequency of sexual seedlings is not related to the taxonomic affinities of the parents, arrived at by Lidforss, was confirmed. The sexual hybrids were usually weaker than the apomictics.

4284 Lazareva, A. G. & Eliseev, E. I.
**(The effect of ecological conditions upon raspberries in the foot hills of the North Caucasus).**
Fiz. Rasten. (Phys. Pl.) 1959 : **6** : 228–31. [Russian].

Data on growth period, rate of growth, winter injury to stems and buds, yield, and biochemical and physiological characters of the leaves and stems for several varieties grown in exposed and sheltered positions near Majkop are presented.

4285 Haskell, G.
**The raspberry wild in Britain.**
Watsonia 1960 : **4** : 238–55.

"Progenies of seed of raspberry (*Rubus idaeus* L.) harvested wild from 15 English, 7 Scottish, 4 Welsh, 2 German and 2 Swiss sources were studied in the field. No new genes were found. All seedlings examined were diploid ($2n = 14$), but one rosette plant failing to flower had diploid and tetraploid shoots. The frequencies of spine colour, habit, leaf colour and leaflet number varied; one family segregated spineless plants. Most plants were hairy, in contrast to earlier reports. Investigations were made on flower-bud development and flowering times; five families segregated for autumn flowering. Analyses were also made of dieback, vegetative bud-break, flower-bud development, annual variation in flowering-time and fruit ripening. These biometrical characters are not essentially related to geographical origin. Male plants with healthy pollen occurred in 3 families. Males are possibly more sensitive to environment than hermaphrodites; a cycle is given to illustrate how male plants are maintained in natural populations. Six families segregated non-red fruits. Ripe fruits are mostly deep purplish-red, and markedly smaller than those of cultivated varieties. Some families had large, good flavoured fruits, suggesting derivation or introgression from cultivated varieties. The frequencies with which 7 genes were segregating in the families show a Poisson distribution. Wild raspberries are remarkably homozygous, the maximum number of heterozygous genes found in a family being four. The differences between wild and cultivated raspberries are considered in relation to the origin of 'Lloyd George': wild plants usually produce many short, hairy canes, whereas cultivated varieties mostly have tall, few, subglabrous canes. The spineless character should be of use in raspberry breeding. The absence of a recognisable cline in wild British *R. idaeus* may be attributable to Great Britain representing only a relatively small area of the natural distribution."

[Author's summary].

4286 Britton, D. M., Lawrence, F. J. & Haut, I. C.
**The inheritance of apricot fruit-color in raspberries.**
Canad. J. Genet. Cyt. 1959 : **1** : 89–93.

In an attempt to retain the heterosis of purple raspberries (produced by black x red crosses) while eliminating the purple fruit colour, a breeding programme utilizing the apricot-fruited varieties of both red and black raspberries was undertaken to determine the inheritance of fruit colour.

Apricot-fruited black x red-fruited red raspberries produced progenies of a uniform purple colour. Apricot-fruited black x apricot-fruited red raspberries produced only apricot-fruited progenies. Black-fruited black x apricot-fruited red raspberries gave purple-fruited progenies. A final series of apricot-fruited black x purple-fruited purple raspberries yielded progenies exhibiting a range of fruit colour from light

purple to black, suggesting that it should be possible to develop a black-fruited purple raspberry from these.
It is postulated that the lack of red pigment characterizing the apricot-fruited varieties is controlled by a gene *t* in both red and black raspberries, and that this gene is epistatic to the gene or genes controlling the formation of black pigment in black raspberries.

4287 Stace-Smith, R.
**Studies on *Rubus* virus diseases in British Columbia. VI. Varietal susceptibility to aphid infestation in relation to virus acquisition.**
Canad. J. Bot. 1960 : **38** : 283–85.
Field populations of *Amphorophora rubi* were recorded for 4 years on 13 varieties of raspberry. Lloyd George and St. Walfried were immune and Malling Enterprise and Malling Promise resistant, these four varieties being derived from *Rubus idaeus*. The remaining varieties, all derived primarily from *R. idaeus* ssp. *strigosus*, were susceptible. Aphids acquired the black raspberry necrosis virus with difficulty from the immune varieties and also from the susceptible variety St. Regis, but acquired it readily from the remaining ten entries.

4288 Cadman, C. H.
**Genetics as an aid to the control of plant virus infection.**
Heredity 1960 : **14** : p. 222. (Abst.).
"The production of varieties of plants which resist, or are immune from, infection by viruses, or which escape infection because unpalatable to virus vectors, seems to offer the most lasting solution to the problem of controlling virus spread in the field. These possibilities seem not to have been fully explored by geneticists, particularly in the raspberry, where genes controlling immunity or resistance to aphid- and soil-borne viruses exist among commercial varieties."

4289 Haskell, G.
**Phenoploidy and the distribution of European and British blackberries (*Rubus fruticosus agg.*).**
Heredity 1960 : **14** : p. 221. (Abst.).
The changes in proportion of the subsections of apomictic polyploids of *Rubus* across Europe have been determined. Northwestern countries have a higher frequency of "simple" forms of blackberries and southeastern regions a higher proportion of complex types. The distribution of 344 "species" of blackberries in Britain representing five subsections was analysed. Southeast England constitutes the centre of diversity; this finding may be related to proximity with the continent or the fact that more intensive botanical studies have been made in this region. The general pattern of distribution reflects the limits of glaciation, with the diversity of species north of the original limits of glaciation falling off rapidly. Subsections containing taxonomically simpler types are less restricted in their distribution than subsections composed of complex types. The basis of the variation in the apomictic polyploids has been considered in relation to the cytological origin of apomixis.

4290 Nilsson, F.
**Polyploidy in the genus Ribes.**
Genet. agr. 1960 : **11** : 225–42.
Colchicine-induced tetraploids of *R. grossularia*, *R. oxyacanthoides*, *R. rubrum*, *R. nigrum* and *R. alpinum* and of various interspecific hybrids are described [cf. XXII, 1429]. Intrasectional hybrids receiving closest attention are: section *Ribesia*, *R. vulgare* x *R. rubrum*; section *Grossularia*, *R. grossularia* x *R. divaricatum*; and section *Coreosma*, *R. nigrum* x *R. sanguineum*, *R. nigrum* x *R. aureum* and *R. sanguineum* x *R. aureum* [cf. XXVI, 2816]. Hybrids in the *Ribesia* and *Grossularia* sections were all fertile, but in *Coreosma* only *R. nigrum* x *R. sanguineum* showed some degree of fertility. In all cases tetraploid hybrids showed reduced fertility. Attempts to induce tetraploidy in the sterile *Coreosma* hybrids in order to obtain fertile plants have so far been unsuccessful.
Six intersectional hybrids, five of the *Coreosma* x *Grossularia* type and one of the *Ribesia* x *Coreosma* type, were grown. All were sterile. Tetraploidy was induced in three of these and the resulting fertile plants are considered as new amphidiploid species and named [cf. XXVII, 4306].

4291 Tapio, E.
Karviaishärmä ja sen torjunta. (**Gooseberry mildew and its control**).
Koetoiminta ja Käytäntö 1959 : **16** : p. 10.
The varieties most resistant to *Sphaerotheca mors-uvae* in Finland are Hankkijan herkka [Hankkija Dainty], Hinnonmäen Keltainen [Hinnonmäen Yellow], Pellervo and an American species.

4292 Hondelmann, W.
Gegenwärtige Aspekte der Erdbeerzüchtung. (**Present aspects of strawberry breeding**).
Erwerbsobstbau 1960 : **2** : 103–05.
Recent genetical studies on strawberry carried out in the USA and elsewhere are briefly mentioned and breeding is discussed in general terms.

4293 Suzuki, I., Sugahara, Y., Kotani, A. & Syobu, T.
**(On the new strawberry variety Takane).**
Tokai Kinki Nogyo Shikenjo Engeibu Kenkyu Hokoku/Bull. Hort. Div. Tokai-Kinki agric. Exp. Sta. 1959 : No. 5 : 90–97. [Japanese].
The above variety was selected from Haikara x Fairfax. It is a productive variety adapted to the warmer parts of Japan.

4294 **New strawberry varieties.**
Amer. Fruit Gr. 1960 : **80** : No. 4 : p. 48.
Released by the University of Minnesota Agricultural Experiment Station, Trumpeter is a June-bearing variety notable for its freezing quality, which is superior to that of Premier or Beaver. Midway, a midseason variety developed by the USDA and Maryland Agricultural Experiment Station, is red-core resistant.

4295 Reid, R. D. & Montgomerie, I. G.
**Some problems in breeding strawberries resistant to red core disease (*Phytophthora fragariae* Hickman).**
Heredity 1960 : **14** : p. 222. (Abst.).
Experience gained in breeding for red-core resistance at the Scottish Horticultural Research Institute, Auchincruive, Ayr, is outlined. Susceptible plants, when selfed, have never given rise to resistants. The proportion of seedlings resistant in the first test usually undergoes a progressive reduction in subsequent years. After showing resistance for many years, selections may be attacked by specialized races. Tolerant field-resistant forms are now being produced. Octoploid *Fragaria* spp. have been used extensively. "Laboratory method of assessing susceptibility of seedlings and runners to physiologic race of *P. fragariae* is described. Results obtained by selfing named varieties and wild species of *Fragaria* indicate that it may be possible to increase the resistance of commercial varieties to this disease. Inconsistencies obtained in degree of infection in some of the material tested are discussed."

4296 Popescu, E. & Basamac, D.
Hibrizi *vinifera* de perspectivă obţinuţi la Staţiunea experimentală viticolă Drăgăşani. (**Promising *vinifera* hybrids obtained at the Drăgăşani Viticultural Experiment Station**).
Grădina Via Livada 1959 : **8** : No. 5 : p. 21. (Abst.).
Three promising hybrids which have been used in further crosses are mentioned: 2/13/3 (Crîmpoşie x Hamburg Muscat), 4/24/E (Braghină x Afuz-Ali) and 1/34/6 (Negru vîrtos [Vigorous Black] x Saperavi).

4297 Popescu, G., Poenaru, I. & Oşlobeanu, M.
Hibrizi *vinifera* de perspectivă obţinuţi la Staţiunea experimentală viticolă Odobeşti. (**Promising *vinifera* hybrids obtained at the Odobeşti Viticultural Experimental Station**).
Grădina Via Livada 1959 : **8** : No. 5 : p. 21. (Abst.).
The following recently bred hybrids are mentioned: (1) rootstocks, Băbească neagră [Black Băbească] x Rupestris du Lot 28/5 and Băbească neagră x Riparia x Rupestris 101–14; (2) vintage grapes, Fetească regală [Fetească Royal] x Grasă de Cotnari 5/15 [Cotnari Plump 5/15] and Coarnă albă [White Coarnă] x Galbena de Odobeşti 4/55 [Yellow Odobeşti 4/55]; and (3) some seedlings obtained by open pollination.

4298 Popescu, S.
Studiul potenţialului de producţie a biotipurilor soiului Cadarcă în condiţiile Centrului viticol Miniş. (**A study of the yielding potentialities of biotypes of the variety Cadarcă under the conditions of the Miniş Viticultural Centre**).
Grădina Via Livada 1959 : **8** : No. 5 : p. 22. (Abst.).
Biotypes of the above Rumanian variety with improved yield have been selected.

4299 Oşlobeanu, M. & Mujdaba, F.
Studiul comparativ al unor soiuri de perspectivă pentru sortimentul viticol din regiunea Constanţa. (**A comparative study of some promising varieties for the viticultural assortment of the Constanţa region**).
Grădina Via Livada 1959 : **8** : No. 5 : p. 22. (Abst.).
Trials of vintage varieties and rootstocks at the Murfatlar research station, Rumania, are reported.

4300 Professor Dr. Bernhard Husfeld 60 Jahre. (**Professor Dr. Bernhard Husfeld 60 years old**).
Saatgutwirtschaft 1960 : **12** : p. 141.
The achievements of the Director of the Research Institute for Grape Breeding at Geilweilerhof are mentioned on the occasion of his sixtieth birthday.

4301 Cosmo, I. & Forti, R.
**"Marzemino".**
Ann. Sper. agr. 1960 : **14** : No. 2 : Suppl. : cxxix–cxxxix.
The vine known under this name and a number of variants have been grown in northern Italy for several centuries for preparing red wines, both dry and sweet.

4302 Breviglieri, N. & Casini, E.
**"Mammolo".**
Ann. Sper. agr. 1960 : **14** : No. 2 : Suppl. : cxli–cli.
The vine described is grown in Tuscany for wine making; when mixed with other varieties it imparts the characteristic aroma of the red wines of that area.

4303 Breviglieri, N. & Casini, E.
**"Biancone di Portoferraio".**
Ann. Sper. agr. 1960 : **14** : No. 2 : Suppl. : cliii–clxi.
The white grape of this name is grown on the island of Elba but is thought to have originated in Corsica. It is used both fresh and for making a white wine of rather poor quality.

4304 Breviglieri, N. & Messerini, A.
**"Bonamico".**
Ann. Sper. agr. 1960 : **14** : No. 2 : Suppl. : clxiii–clxxi.
This ancient vine is grown in Tuscany for making a wine used for blending with other stronger wines.

4305 Prosperi, V., Pirovano, A. & Bruni, B.
**"Cesanesi".**
Ann. Sper. agr. 1960 : **14** : No. 2 : Suppl. : clxxiii–clxxxvii.
Two forms of the vine known as Cesanese are described, one with large berries and one with small. Both are grown in the vicinity of Rome for making red wines, dry from the former and sweet from the latter form.

4306 Prosperi, V., Pirovano, A. & Bruni, B.
**"Cesanese d'affile".**
Ann. Sper. agr. 1960 : **14** : No. 2 : Suppl. : clxxxi–clxxxvii.
The vine described is grown in central Italy for making a sweet dessert wine.

4307 Prosperi, V., Pirovano, A. & Bruni, B.
**"Bellone".**
Ann. Sper. agr. 1960 : **14** : No. 2 : Suppl. : clxxxix–cxcv.
The vine described was mentioned by Pliny and is still grown in central Italy, where it produces a light white wine.

4308 Un vitigno di gran pregio: il Trebbiano nero. (**A vine of great value: Trebbiano nero**).
Ital. agric. 1960 : **97** : No. 5 : p. xiv.
The vine Trebbiano nero [Black Trebbiano], a seedling from Trebbiano x Raspirosso, is described as late in flowering, whereby it escapes late frosts or hail; it is vigorous and produces dark black grapes rich in pigment and suitable for wine making.

4309 Bejan, T. & Dobre, D.
Contribuţia cercetătorilor noştri la îmbunătăţirea sortimentului de viţă de vie. (**Contributions of our investigators to the improvement of the vine assortment**).
Grădina Via Livada 1959 : **8** : No. 1 : 21–23.
Four varieties raised by G. Constantinescu and E. Negreanu are described: 4/3/3 (Crimpoşie x Perla de Csaba [Csaba Pearl] + Regina Viilor [Queen of the Vineyards] + Băşicată), an early-maturing grape with a sugar content of 170–180 g./l.; 4/3/9 [cf. XXVIII, 2234]; 2/13/11 (seedling of Regina Viilor), another early variety; and 3/2/1 (also a seedling of Regina Viilor), a grape ripening at the end of August and producing large golden berries.

4310 Constantinescu, G. & Negreanu, E.
Soiuri de struguri de masă cu coacere timpurie. (**Early-maturing varieties of dessert grapes**).
Grădina Via Livada 1959 : **8** : No. 5 : p. 20. (Abst.).
The following newly-bred early-maturing varieties are mentioned: 4/3/9 (Perla de Bucureşti B) [cf. XXVIII, 2234] and 4/3/3 (Perla de Bucureşti C); 4/2/18 (Bucur) and 2/13/11 (Centenarul Unirii [The Centenary of Union]), offspring of Regina Viilor [Queen of the Vineyards]; and 3/2/1. The varieties mature in the order cited.

4311 **Grapes. New varieties.**
Amer. Fruit Gr. 1960 : **80** : No. 4 : p. 46.
Osborn, Keating and Chilcott, which originated as open-pollinated seedlings of Armalaga, Last Rose and Volney respectively, at the Southern Great Plains Field Station, Woodward, Okla., have been released. All have proved highly resistant to drought in western Oklahoma. Somewhat lacking in winter hardiness, they are probably best adapted to the southwestern region of the USA. Respectively, they bear black, white and dark red to black fruits, with good quality. Chilcott has a muscat flavour.

4312 Croce, F. M.
La "Floradela", une nouvelle variété de raisin. (**Floradela, a new grape variety**).
Bull. Off. int. Vin 1960 : **33** : p. 127. (Abst.).
Selected from a number of small vine plants which appeared by chance in a private garden in Mendoza, Argentina, this variety has few or no seeds and is said to be suitable for wine making or dessert. The skin however is rather thick.

4313 Poenaru, I. & Lăzărescu, V.
Importanţa practică a cunoaşterii fazei dezmugurităului la soiurile de viţă de vie. (**The practical importance of knowledge of the phase of breaking of the buds in vine varieties**).
Grădina Via Livada 1959 : **8** : No. 3 : 23–28.
Accumulated temperature units required for bud breaking over a zero threshold air temperature of 5° C. are calculated for 75 varieties grown in Rumania.

4314 Loladze, V. R.
(**An instance of berry setting under conditions of isolating female-functioning vine varieties**).
Agrobiologija (Agrobiology) 1959 : No. 3 : 465–67. [Russian].
In pollination studies at Telavi, Georgia Tavkveri and Haristvala šavi developed parthenocarpic fruits and others from self fertilization. Other varieties with female-functioning flowers bore no parthenocarpic fruits but some, for instance Haristvala tetri, bore small grapes on selfing.

4315 Constantinescu, G. *et al.*
Studiul condiţiilor de cultură a viţei de vie pe rădăcini proprii în Dobrogea. (**A study of the conditions of cultivation of vines on their own roots in Dobrogea**).
Grădina Via Livada 1959 : **8** : No. 5 : p. 23. (Abst.).

Constantinescu, G., Negreanu, E., Alexei, O., Boureanu, C. & Bari, T.
Studiul comparativ al soiurilor de viţă roditoare altoite şi pe rădăcini proprii. (**A comparative study of grafted and own-rooted vine varieties**).
Ibid. 1959 : **8** : No. 5 : 23–24. (Abst.).
On very sandy soils in Rumania, it is possible to grow own-rooted varieties. The varieties most suitable for this method of cultivation are indicated and their performance compared with that when grafted.

4316 Rampal, L.
Dix ans d'observations dans deux vignobles expérimentaux de comportement de cépages de cuve du Var. (**Ten years' observation at two experimental vineyards on the performance of vines for wine-making at Var**).
Bull. tech. Ing. Serv. agric. 1960 : No. 148 : 161–74.
As measured by their effect on yield and wine quality at the Brignoles and Ramatuelle vineyards, seven rootstocks are listed in order of importance for each of the varieties Carignan, Cinsaut, Ugni blanc and Clairette.

4317 Wainstein, P. & Abitbol, J.
La alimentación mineral de la vid. Características de algunas variedades europeas y portainjertos reveladas por el diagnóstico foliar. (**The mineral nutrition of the vine. The characteristics of some European varieties and rootstocks as revealed by foliar diagnosis**).
Rev. Invest. agríc., B. Aires 1959 : **13** : 303–20.
Data are presented on the contents of N, P and K of the leaves of seven scion varieties and five rootstocks tested during flowering, fruit maturation and maturity over a period of three years at Luján de Cuyo and Godoy Cruz, Mendoza, Argentina. All the material showed a decrease in each element from flowering to maturity, the decreases being greater in the rootstocks than in the grape varieties. The rootstock

Berlandieri x Riparia 420–A had a particularly high P content and among the scion varieties Malbeck was richest in P.

4318 Saakjan, R. G.
**(Some biochemical processes in vine varieties differing in frost resistance).**
Fiz. Rasten. (Phys. Pl.) 1959 : **6** : 219–21. [Russian].

The differences in the catalase activity, ascorbic-acid content and oxidation values of the leaves and the synthesis of starch in the shoots between frost-resistant and nonhardy varieties in Armenia are described. Higher values in all above respects were obtained for the frost-resistant varieties.

## FOREST TREES

4319 Hagman, M.
Lajikkeen valinnasta metsätaloudessa. **(Selection of varieties in forestry).**
Koetoiminta ja Käytäntö 1959 : **16** : p. 9.

The importance of selection of suitable varieties of forest trees and the advantages of growing plus trees of both broad-leaved and coniferous species are discussed.

4320 Nilsson, B.
Föreningen Skogsträdsförädling. Aktuellt från sydvästra distriktet. **(Association for Forest Tree Breeding. News from the south-western district).**
Skogen 1960 : **47** : 178–79.

In south-western Sweden, some 400 mother pines in 40 plantations, originally selected on the basis of mother-tree characters, are now undergoing progeny tests. Older progeny trials, from over 1000 open-pollinated mother trees, are also in progress. Other projects include trials of crosses of material of differing provenance in pine and spruce, tests of interspecific larch hybrids and experiments on the stimulation of cone setting on grafts.

4321 Stern, K.
Populationsgenetische Probleme in der Baumrassenforschung und Forstpflanzenzüchtung. **(Problems of population genetics in studies of tree races and forest-tree breeding).**
Schweiz. Z. Forstwes. 1958 : **109** : 458–77.

In this general review, some basic principles of population genetics and their application to forest-tree improvement are outlined, the following topics being touched upon: Mendelian genetics; the frequency and spread of genes in populations; clinal variation; provenance trials; and the evaluation of genotypic and environmental differences between populations.

4322 Langlet, O.
Proveniensfrågor på konferens i Prag. **(Provenance questions at a conference in Prague).**
Skogen 1959 : **46** : 418–19.

Some of the papers read at an international forestry conference held in Prague during 24–29 August 1959 are briefly reported. Stastny, speaking on the results of 50-year old provenance trials in Slovakia, said that pines from a maritime climate were inferior in production to continental forms, while among larches, those from the Sudeten were the most productive and the most resistant to drought. P. Bouvard reported that differences in germination and seedling growth occurred according to whether the seeds came from dry or humid regions in France. The use of gas chromatography in distinguishing physiological races of coniferous trees was discussed by Cvrkal.

4323 Fischer, F. & Kobert, H.
Beitrag zur Frage der vegetativen Vermehrung von Waldbaumarten. **(Contribution to the problem of vegetative propagation in forest tree species).**
Mitt. schweiz. ZentAnst. forstl. Versuchsw. 1960 : **36** : 1–32.

Vegetative propagation was achieved in *Picea abies* by grafting one-year-old shoots from a 60–70-year-old tree and a number of 10-year old trees on to root cuttings from a 10-year-old spruce. The best length and diameter for the root cuttings were 50–70 cm. and 2–4 mm. respectively. Six weeks after grafting, new shoots and new lateral roots were present while ungrafted shoot cuttings planted at the same time merely showed extensive callus formation.

4324 Worsley, R. G. F.
**Pollen fractionation.**
Silv. genet. 1959 : **8** : 173–75.

The apparatus described consists of a compressor supplying a steady flow of air to a vertical glass tube containing the pollen. The air flow is first adjusted so that dead light grains are carried away; the pressure is then increased and the pollen is carried into a receptacle connected to the top of the tube leaving behind dirt and

clogged grains. The best results are obtained using pollen which has no large air sacs. This apparatus may also be used for obtaining pollen at a wide range of humidities.

4325 VAN BUIJTENEN, J. P. & EINSPAHR, D. W.
**Note on the presence of sex chromosomes in *Populus tremuloides*.**
Bot. Gaz. 1959 : **121** : 60–61.

Twenty-eight staminate trees, all belonging to different clones, were examined at metaphase I for the presence of a heteromorphic chromosome pair. Such a pair was found in six trees. A large pair equal in size was seen in four individuals and an equal small pair in the remaining 18.

4326 MAY, S.
Una manifestazione di bisessualità nel pioppo nero americano. (**A case of bisexuality in *Populus deltoides*).**
Cellulosa e Carta 1959 : **10** : No. 7 : 6–8.

Inflorescences with hermaphrodite flowers bearing a variable number of stamens and a normal ovary have been observed on a four-year-old tree raised from seed from Alabama. Seedlings from the tree are under observation. The possible use of the bisexual character in developing triploids is discussed.

4327 RÜSCH, J.
Das Verhältnis von Transpiration und Assimilation als physiologische Kenngrösse, untersucht an Pappelklonen.
(**The ratio of transpiration to assimilation as a physiological criterion, studied on poplar clones).**
Züchter 1959 : **29** : 348–54.

By infrared absorption it was possible to determine the $CO_2$ and water vapour released by leaves growing in the light of a xenon lamp and so estimate the rates of assimilation and transpiration. Measurements on *Populus euramericana* cls. *vernirubens*, *marilandica*, Flachslanden and *serotina* showed them to differ little in assimilation rate, though cl. *marilandica* was significantly higher than the rest and Flachslanden was better than *vernirubens* and *serotina* in low light intensities. The differences in transpiration were also slight but *vernirubens* transpired significantly less than the others. The ratio of transpiration : assimilation was lowest in *marilandica*, showing this clone to be the most economical in its water relations.

4328 MANŽOS, A. M.
**(A quick growing form of *Populus balsamifera* L. obtained by pollinating female flowers of *P. balsamifera* with calibrated pollen of this species).**
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1960 : **131** : 433–35. [Russian].

An account is given of Siberian experiments on pollination by pollen of different sizes, together with observations on the growth rate of the resulting progeny. A few plants from pollination with large pollen measuring 44–60 $\mu$ had the highest rate of growth. Cytological analyses showed that they were triploids, with $2n = 57$ chromosomes. However, a large proportion of the progeny which arose from fertilizations by large pollen grains was malformed and inferior in growth rate to the plants obtained by pollination with pollen measuring 16–40 $\mu$.

4329 SAUER, E.
Über die Beastungsverhältnisse von 1 jährigen Baumschulpflanzen der 16 Wirtschaftspappel-Altsorten. (**The branch relationships of 1-year-old nursery plants of 16 old commercial varieties of poplar).**
Silv. genet. 1959 : **8** : 161–72.

Measurements were made on three plants from each variety. The mean number of the nodes, the mean length of the branches and the mean horizontal distance between the tip of the branch and the trunk were dependent on plant height. With the small number of plants studied, it was not possible to determine the regression for each variety between the mean values of the characters and total height. Each variety was found to have a different regression for the number of branches. Mean values of all characters were adjusted according to total height using the regression coefficient of the mean regression of all varieties. Significant differences were revealed.

The mean height of the nodes was correlated with the number of branches and this depended on the relationship between total height and number of branches. There was also a relationship between the mean value of the average height of the nodes in each variety and the mean value of the number of branches, this being independent of total height. Upper branches appeared to be shorter than lower ones and this tendency differed with the varieties. Differences in the angle of insertion of the branches were found between individuals within

varieties and between varieties. The upper branches of all varieties were more upright than the lower branches. In broad-crowned varieties, the upper branches were only slightly more upright than the lower and in the narrow-crowned varieties the branch angle becomes much more acute in the upper part of the tree. Notes are provided on the characteristics of each variety studied.

4330 Butin, H.
Über die Sporenkeimung von *Dothichiza populea* Sacc. et Br. in wässrigen Rindenextrakten verschiedener Pappelsorten. (**The spore germination of *D. populea* Sacc. et Br. in aqueous bark extracts of different poplar varieties**).
Ber. dtsch. bot. Ges. 1960 : **37** : 185–97.
The effects of various treatments on the inhibitory action of bark extracts on spore germination are reported. On dilution the inhibitory action of an extract of *Populus trichocarpa* decreased and was finally changed into an enhancing effect. This indicates the presence of a factor enhancing spore germination, the effect of this factor being overcome by that of an inhibitory factor at high concentrations. Seasonal changes influence the effect of bark extracts. Spore germination was inhibited in the extract of *P. trichocarpa* which is resistant to the pathogen under natural conditions and spore germination was most rapid in an extract of *P.* x *euramericana* cv. *robusta* which is susceptible in the field; *P. euramericana* cv. *marilandica* was intermediate as regards inhibition of spore germination and susceptibility. Thus the resistance of other varieties may be determined by testing the germination of spores in a bark extract.

4331 Veldeman, R. & Welvaert, W.
Studie van enkele populiersoorten in verband met hun vatbaarheid voor *Dothichiza populea*. (**Study of some poplar species in relation to their susceptibility to *D. populea***).
Meded. LandbHoogesch. Gent 1959 : **24** : 671–89.
As a basis for studies of resistance to *D. populea*, data are given on moisture content of the bark, rate of water loss under various conditions, numbers of lenticels per unit area, degree of shrinkage in relation to water loss and thickness of phloem and periderm in one-year old shoots or cuttings of nine poplar species and varieties. *D. populea* appeared often to be a secondary infection in twigs already infected with *Phoma*. Some evidence that bark extracts from poplars influence the growth of *D. populea in vitro* was obtained.

4332 Richens, R. H.
**Cambridgeshire elms.**
Nat. Cambridgeshire 1960 : No. 3 : 18–22.
This article on the history and range of variation of elms in Cambridgeshire summarizes the principal conclusions of an earlier paper [XXIX, 764] with some additional data on the elms of the Isle of Ely.

4333 Kárpáti, Z.
Die Sorbus-Arten Ungarns und der angrenzenden Gebiete. (**The *Sorbus* species of Hungary and neighbouring regions**).
Feddes Repert. 1960 : **62** : 71–320.
Latin keys and diagnoses and details of distribution are given for species, subspecies, forms and interspecific hybrids in the sections *Cormus, Aucuparia, Aria, Torminaria* and *Chamaemespilus* and also for intersectional hybrids and intermediate forms.

**Forestry Technical Papers. No. 3 : Forests Commission, Victoria 1960** : Pp. 36. (Mimeographed).
The third issue of this series of papers provides an account of the project recently initiated on *Pinus radiata* by the Forests Commission of Victoria, as well as containing items giving relevant background information. It includes the following articles on breeding:—

4334 *Simpfendorfer, K. J. A review of forest tree improvement. (pp. 1–5).*
Largely summarized from a book by C. Syrach Larsen [cf. XXVII, p. 167], the general history of forest-tree genetics is outlined. Genetical work and the search for plus trees in Australasia, chiefly *Pinus* spp., are then outlined.

4335 *Simpfendorfer, K. J.* P. radiata *plus tree search in Victoria. (pp. 6–13).*
The above search was initiated in 1958. The following aspects are described: specification of an élite tree for Victoria; organization of the search; the provisional plus-tree selection which has been effected; and wood-quality assessment.

4336 *Simpfendorfer, K. J. Scion gardens and seed orchards. (pp. 24–27).*
The establishment of scion gardens and seed orchards is generally discussed and objectives in this respect with *P. radiata* in Victoria are outlined.

4337 *Pederick, L. A. Determination of the genotype. (pp. 33–34).*
The value of clonal and progeny trials of plus trees is indicated, with reference to plans for such trials on *P. radiata* in Victoria.

4338 **Breeding pines to yield more gum.**
Agric. Res., Wash. 1960 : **8** : No. 11 : p. 12.
Ability to give high resin yield has been found to be heritable in *Pinus elliottii* at the Lake City Research Center, Fla. It is hoped that the progeny from seed orchards composed of the best among the selected trees will be capable of giving two and a half times more resin than unselected trees.

4339 Obozov, A.
**(A pyramidal pine).**
Les. Hoz. (Forestry) 1960 : No. 3 : p. 79. [Russian].
An adult quick-growing tree with a pyramidal crown was found in the Kokčetav province of Kazahstan. It has a trunk which tapers slightly upwards and is free from large branches that might impair timber quality. Seedlings of the above pine will be raised as it is thought that its valuable characteristics may be heritable.

4340 Kiellander, C. L.
Svensk gran och kontinentgran. **(Swedish spruce and continental spruce).**
Skogen 1960 : **47** : 150–51.
The results of trials established at Ekered (56° 22′ N.) and Säfsnäs (60° 6′ N.) in southern Sweden in 1941 are reported. The parents of the tested material were Continental and Swedish spruces grown in various provinces in Sweden. From the results it is concluded that: (1) the Continental parent stands at Nordanå and Björnstorp contained more valuable types than other stands; (2) genotypes of breeding value are also to be found in the Markaryd, Omberg, Oretorp and Puus I stands; and (3) Swedish spruce may equal Continental spruce in the districts included in the experiment. Earlier observations that Continental spruce is superior to Swedish spruce are thought to refer only to the southern and western coastal areas and other places with a favourable climate, while the present study refers to less favourable climatic zones.

4341 De Torok, D. & White, P. R.
**Cytological instability in tumors of *Picea glauca*.**
Science 1960 : **131** : 730–32.
In smear preparations of tissue cultures of normal and adjacent tumour wood, cells from the former were regular in mitotic behaviour, most of them being diploid ($2n = 22$) and a few tetraploid. Almost none were aneuploid. The tumour tissue contained cells with chromosome numbers ranging from 3 to over 70, with a high proportion of aneuploid but otherwise apparently normal mitoses.

4342 Fairbairn, W. A.
**Early controlled cross-fertilisation of European and Japanese larches.**
Scot. For. 1959 : **13** : 167–69.
An examination of records in the Department of Forestry in the University of Edinburgh has shown that six hybrids were obtained from the cross *Larix europaea* x *L. leptolepis* effected in 1914 and ten from the reciprocal cross carried out in 1915. Only the first group survived, five of the trees being poor in form and one excellent. All six were blown down in the January gales of 1953.

4343 Vincent, G.
Lärchentypen in Mitteleuropa. **(Larch types in central Europe).**
Schweiz. Z. Forstwes. 1958 : **109** : 506–19.
Work on larch races is reviewed and it is noted that, compared with larches from low altitudes, those from high altitudes flush earlier in spring, cease annual growth sooner, have fewer needles, grow more slowly and are more resistant during early growth to drought and to competition from weeds. These ecotypic differences do not correspond to any morphological differences. The two morphological groups distinguished by Rubner and Svoboda, one occurring in the Alps and the other in the Sudeten, the Carpathians and Poland, both include several altitudinal ecotypes.

4344 Allen, G. S.
**Factors affecting the viability and germination behavior of coniferous seed. IV. Stratification period and incubation temperature, *Pseudotsuga menziesii* (Mirb.) Franco.**
For. Chron. 1960 : **36** : 18–29.
Seed lots from different geographical sources were stratified for periods of up to 150 days and germinated at different temperatures (10°–30° C.). The results suggested that it may prove possible to distinguish broad provenance classes on the basis of germination behaviour at 10° or 15° C. after a short period of stratification.

## VEGETABLES

4345 Erwin Loerke 25 Jahre im Dienst für die deutsche Pflanzenzucht. (**Erwin Loerke, 25 years in service for German plant breeding**).
Saatgutwirtschaft 1960 : **12** : p. 111.

A note is provided on the work of this breeder who has developed some valuable varieties of pea and bean.

4346 Neuheiten für die Branche). (**Novelties for the trade**).
Saatgutwirtschaft 1960 : **12** : p. 67, 98–99, 126, 159.

**Celeriac.** Roka is a vigorous variety with a hemispherical root. It will grow under a wide range of conditions, gives good yields and keeps well in winter. This variety has a good flavour and shows high resistance to *Septoria apii* and *Phoma apiicola*.

**Radish.** Unus Treib [Unus Forcing] is an early white variety of medium length suitable for forcing and cultivation in the open. Under favourable conditions the radishes develop within six or seven weeks. Minifolia has short foliage and is particularly suitable for early forcing, the growth period being very short. The tuber is spherical, firm and juicy, the colour being bright scarlet.

**Cabbage.** Septemberwirsing GZG Marne [September Savoy cabbage GZG Marne] is a green, finely-curled variety with good market quality and resistance to bursting. The harvest is from August to October according to the time of planting. Ferrus HKZ, also a Savoy cabbage, is an improvement of Eisenkopf [Iron Head]; the head is finely curled, firm and greenish yellow. This variety is suitable for field and garden cultivation; it will grow under a wide range of conditions and requires little space. Septemberrot GZG Marne [September Red GZG Marne] is a productive red cabbage harvested in September or October according to the date of planting; it is suitable for storing.

**Pumpkin.** Goliath is outstanding for the quality of its flesh which remains firm after cooking and resembles cooked pineapple in structure; the flesh is transparent and bright yellow in colour. The weight of the fruit is said to reach 45 kg. and the yield is good.

**Broad Bean.** Lux is an improvement of Dreifachweisse [Threefold White], the seed being smaller and softer skinned; it does not darken after canning and the liquid in the can does not become cloudy. Lux has a strong flavour. It is suitable for cultivation in small gardens and on a large scale. The yield of Lux is like that of Dreifachweisse.

***Phaseolus.*** Grandresista is a dwarf, wax variety with stringless pods resembling those of Granda. It is resistant to anthracnose and mosaic and gives an early and good yield. Meteor, another dwarf variety, is medium early and has dark green, stringless pods with white seed. It is resistant to diseases and all the pods ripen together. Meteor is suitable for fresh marketing, canning and freezing. Hilda is a medium-early, climbing variety of slicing bean with wide stringless pods which are rather fleshy and of good flavour; the yield is high. Goldelfe [Gold Elf] is a wax, climbing bean with luxuriant healthy growth. The yellow pods are tender, stringless and of good flavour. This variety is of medium-early maturity and the yield is good. Neckarkönigin [Neckar Queen] is a particularly productive, green-podded and stringless variety of climbing bean which has proved superior to Meisterstöck [Masterpiece] and Kapitän Weddigen. The pods, which may reach 28 cm. in length, are very fleshy and remain tender for a long time; they are therefore valuable for both preserving and fresh marketing. The harvest is medium early. Goldstrahl [Gold Ray], another climbing bean, is an early wax variety bearing 6–8 pods in each bunch; the tender yellow pods are 18–22 cm. long and of good flavour. The seed is white.

**Pea.** Rheinische Zucker [Rhine Sugar] is of compact growth, reaching 70 cm. in height. The pods are 8–10 cm. long and free of membrane; the seeds are of the marrowfat type and always have a good sweet taste. This variety could replace Frühe Heinrich [Early Heinrich] and Graue Buntblühende [Gray Motley-flowered] which it surpasses in yield and quality. Zuga is said to be the earliest green-seeded sugar pea with very sweet marrowfat seed; it is a valuable replacement for the old variety Frühe niedrige volltragende [Early Low Full Bearing]. Zuga is a vigorous, low-growing variety with a strong stem suitable for cultivation in the field and in small gardens. Maibote (May Messenger) is a shelling pea which reaches a height of 90 cm. It is very early, the developmental period being 55 days. This variety outyields Saxa and is suitable for large-scale cultivation for the fresh market and for growing in gardens.

4347 Dumitrescu, M.
Soiuri de perspectivă pentru legumicultura din R.P.R. (**Promising varieties for vegetable growing in the Rumanian People's Republic**).
Grădina Via Livada 1958 : **7** : No. 12 : 7–13.
Short descriptions of local and introduced varieties of red pepper, okra, cucumber, onion, garden bean, garden pea, egg plant, melon, water melon, radish, beetroot, lettuce, spinach, tomato and cabbage recommended for Rumanian conditions are provided.

4348 Cristea, Ch. & Sociu, S.
Ameliorarea populațiilor de ceapă și varză de Buzău. (**The improvement of the Buzău onion and cabbage populations**).
Grădina Via Livada 1959 : **8** : No. 9 : 13–18.
The Buzău onion and the Buzău cabbage represent land races in which considerable heterogeneity occurs. Both are being improved by selection. Three biotypes, characterized by bulb shape, are distinguished within the Buzău onion which is also being utilized in a hybridization programme.

4349 Vik, J.
Gransking av frøspiringa ved ulike såtider i erter, bønner og piklesagurk 1954–1956. (**Studies of germination at different sowing dates in peas, French beans and gherkins, 1954-56**).
Forskn. Fors. Lanbr. 1960 : **11** : 9–30.
The effects of sowing date and soil type on germination were studied in Norway in five varieties of each of the above crops. Varietal differences were apparent within years but not in the averages of the whole period.

4350 Hintze, S.
Sort- och stamförsök med rödbetor 1955–1957. (**Variety and strain trials of beetroots, 1955-1957**).
Medd. Trädgårdsförs. 1960 : No. 128 : Pp. 27.
Data on yield, uniformity, bolting tendency and quality are given for ten varieties tested in Sweden, Norway, Denmark and Finland.
Among the best were Rubia OJO/51 and Crosby OE/54.

4351 Kružilin, A. S. & Švedskaja, Z. M.
(**Accelerated reproduction of the seed of new varieties and hybrids of biennial plants by means of grafting**).
Fiz. Rasten. (Phys. Pl.) 1959 : **6** : 625–26. [Russian].
A method of seed production in the first year by such plants as beetroot, carrot and cabbage has been developed at the Timirjazev Institute of Plant Physiology. It involves grafting young scions on mature plants of the same or a different variety or species. The seed production of carrot was accelerated by grafting it on flowering stems of another carrot variety or on dill and of cabbage by grafting it on mustard or spring swede-rape.

4352 Sagajdak, I. N.
(**Vegetative hybridization of radishes by grafting on supplementary roots**).
Agrobiologija (Agrobiology) 1959 : No. 3 : 453–55. [Russian].
The root of a variety was incised at the base for insertion of the root of another variety, which was cut so as to form a wedge at the apex, in experiments at Odessa. A table shows the morphological variability of the first seed generation of Ledjanaja Sosul'ka [Icicle]/ Rozovokrasnyj [Pink-red]. About half the plants resembled Ledjanaja Sosul'ka, while the other half differed from it by the shape, colour or shape and colour of the roots; a few plants resembled the other graft component morphologically.

4353 Calcatin, N., Panait, T., Oarză, G. & Găureanu, I.
Cîtea populații de ceapă și usturoi cultivate în Moldova. (**Some local populations of onion and garlic cultivated in Moldavia**).
Grădina Via Livada 1959 : **8** : No. 5 : p. 15. (Abst.).
[Cf. 3254].

4354 Makarov, A. A.
(**Cytoplasmic pollen sterility in the onion**).
Izv. timirjazev. sel'skohozjajstv. Akad. (News Timirjazev agric. Acad.) 1960 : No. 1 : 209–16. [Russian].
Forms characterized by cytoplasmic male sterility were found in the variety Arzamas at the Timirjazev Agricultural Academy. The umbels and flowers of the male-sterile forms differed morphologically from those of normal plants of this variety; the male-sterile plants

also started and finished flowering earlier and, on pollination, usually set more seed. The character of pollen sterility was transmitted to the entire vegetative progeny and to 83·1%–96·9% of the sexual progeny. The plants with sterile pollen were superior to the ordinary plants in earliness, yield and seed quality.

4355 Katayama, Y. & Nagatomo, T.
**(On the progeny of viviparous *Allium fistulosum* propagated by seed, aerial bulbils and bulbs).**
Miyazaki Daigaku Nogakubu Kenkyu Jiho/Bull. Fac. Agric. Univ. Miyazaki 1959 : **5** : 29–35. [Japanese].
Information is provided on the mode of vegetative development and nature of the inflorescence of progenies derived by the three methods cited above. Reference is also made to the occurrence of fine white stripes of uncertain genetic status.

4356 Kazakova, A. A.
**(On the methods of obtaining sterile forms of leek).**
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1959 : **32** : No. 3 : 304–05. [Russian].
By selecting leek plants for a large number of aerial bulbils it was possible to arrive at lines in which the pollen was partially or completely sterile.

4357 Angelescu, H.
Soiuri şi populaţii de usturoi cultivate în Banat. **(Varieties and populations of garlic grown in Banat).**
Grădina Via Livada 1959 : **8** : No. 9 : 18–23.
Agronomic descriptions are given of (1) two garlics grown for bulbs, Cenad and vînătă de Banat [Banat Mauve], a selection of Cenad and two garlics for stews, roşcat de toamnă [Autumn Red], an old population, and mare de stufat [Large Stewing], a recently developed population.

4358 Sharma, A. K. & Bal, A. K.
**A comparative effect of the bark extract of two members of Apocynaceae on plant tissue.**
Portug. acta biol. : Ser. A. 1959 : **6** : 45–64.
The cytological effects of extracts from *Alstonia scholaris* and *Holarrhena antidysenterica* upon the root tips of *Allium sativum* were determined. *Alstonia* extract induced polyteny in resting and early-prophase nuclei after treatment for 96 hr. In contrast, *Holarrhena* extract was highly toxic, causing pycnosis and agglutination, finally resulting in formation of chromatin vesicles.

4359 Cochran, F. D.
**Cytogenetic studies of the species hybrid *Allium fistulosum* x *Allium ascalonicum* and its backcross progenies.**
La. St. Univ. Stud. : Biol. Sci. Ser. undated : No. 2 : Pp. 106.
In $F_1$ hybrids between *A. fistulosum* ($2n = 16$), a species with interstitially localized chiasmata, and *A. ascalonicum*, ($2n = 16$), which has randomized chiasmata, chiasma formation was random. In the $F_1$, the low degree of chromosome pairing and reduced frequency of chiasma formation, together with the high sterility, indicated a limited amount of homology between the genomes of the two species. Using the hybrid as ♂ parent, plants were obtained from crosses with either parent. Although the chromosome number ranged from $n = 6$ to 11 at meiosis II in the $F_1$ hybrids, the majority of the back-cross plants had the normal diploid number of $2n = 16$. About 86% of the back-cross plants involving *A. fistulosum* as recurrent parent had either the randomized or the localized type of chiasma formation, while the remaining 14% had both types within the same nucleus. It is thus apparent that type of chiasma formation was autonomously controlled within the chromosomes themselves. Evidence is given in support of the view that chiasma localization may be controlled by the centromere or procentric segments. In all back crosses to *A. ascalonicum* chiasma formation was random. Cytological and morphological observations on back crosses to both parents indicated that the $F_1$ gametes corresponding to the parental types functioned in the majority of cases. In back crosses to each parental species, two major groups were distinguishable, one closely similar to the maternal parent and the other resembling the $F_1$-hybrid parent. Unreduced male gametes were frequently observed in *A. ascalonicum* and the *A. ascalonicum* ♀ x *A. fistulosum* ♂ hybrid but were not found in *A. fistulosum* or the reciprocal. The cytoplasm thus appears to influence the production of reduced gametes.

4360 Shimizu, Y.
**(Cytological studies on chives).**
Senshokutai (Chromosome)/Kromosomo 1959 : **41** : 1385–95. [Japanese].
Cytological descriptions are given of two

aberrant forms found at Sendai, Japan. One is a dark-green form, twice as high as normal plants, which has a single pair of disorientated chromosomes that behave irregularly at meiosis. The second is a highly sterile triploid which differs little in appearance from normal diploids.

4361 Cartier, D.
La méiose et les associations chromosomiques multiples chez le *Foeniculum vulgare* Gaertn. (**Meiosis and multiple chromosome associations in *F. vulgare* Gaertn.**).
Rev. gén. Bot. 1960 : **67** : 225–42.

Meiosis in the male and female organs and development of the ovule are described. During prophase, complex multivalents are formed which have no effect on the subsequent course of meiosis. The behaviour of the 11 bivalents indicates that the basic chromosome number for the genus is 8. Bivalents during diacinesis always show the same series of configurations which are characteristic of the species.

4362 Reimann-Philipp, R., Zilm, B. & Eresen, H.
Cytologische Untersuchungen zur Identifizierung der Geschlechtschromosomen bei *Asparagus officinalis* L. in Verbindung mit der Züchtung rein männlicher Sorten. (**Cytological investigations on the identification of the sex chromosomes of *A. officinalis* L. in connexion with the breeding of pure male varieties**).
Z. Pflanzenz. 1959 : **42** : 295–304.

Of the 10 bivalents observed during diacinesis of PMCs from completely male or from andromonecious plants, one bivalent could be distinguished by the incomplete pairing and lack of structural homology of the chromosomes. Twenty-nine male plants from the progeny of an andromonecious plant were investigated and 21 found to have the heteromomorphic pair of chromosomes; the other eight had a bivalent showing incomplete pairing but consisting of structurally homologous chromosomes. Since other workers have shown that male and andromonecious plants are heterogametic, it is assumed that bivalents distinguished by incomplete pairing involve the sex chromosomes in the XY or YY condition. As expected the progeny of an andromonecious plant segregated into 2XX : 1XY plant, the two types being distinguished cytologically. It is now possible to distinguish XY and YY plants in the progeny of andromonecious plants without carrying out test crosses. Investigations are now under way to see whether sex chromosomes can be identified in cells of seedlings; this would enable YY plants to be selected at a much earlier stage of development.

4363 Vazart, B.
Présence de fleurs hermaphrodites fonctionnelles chez l'asperge *Asparagus officinalis* L. (**The presence of functional hermaphrodite flowers in asparagus, *A. officinalis* L.**).
Bull. Soc. bot. Fr. 1959 : **106** : 328–29.

Flowers which are morphologically hermaphrodite are relatively frequent in asparagus but only a few of them have been found to produce fruits; these are usually small and contain few or no seeds. The number of hermaphrodite flowers producing seed varies with the season. Monecism has not been found.

4364 Bozzini, A.
Revisione cito-sistematica del genere *Asparagus* L. I. Le specie di *Asparagus* della flora italiana e chiave analitica per la loro determinazione. (**Cytosystematic revision of the genus *Asparagus* L. I. The *Asparagus* species of the Italian flora and an analytic key for their determination**).
Caryologia 1959 : **12** : 199–264.

The hermaphrodite species are found in Africa and in tropical and southern Asia whereas the diecious species are characteristic of central Europe, the Mediterranean and northern and eastern Asia. The ratio of 1 female : 1 male in progenies of *A. officinalis* has been confirmed in the Italian species *A. scaber* and *A. aphyllus*. The systems of Baker and later authors are outlined and discussed. On the basis of a study of an extensive collection of species the value of various diagnostic features is examined. Useful features are considered to be the form of the rhizome and root, evergreen foliage, number of fibrovascular bundles in the cladode, length of stamens, anthers and filaments and their insertion, colour of anthers, pollen grains and berries, size of pollen grains, number of ovules per locule, size and form of seeds, time of differentiation of flower buds, ecological habitat, chromosome number and parasites. The form, dimensions, number and habit of the cladodes are considered less reliable criteria and their use has led to much confusion in the past. A table is given of the chromosome numbers of 24 species, based on reports in the literature,

some of which have been confirmed by the author, and on original observations. Numbers of $2n = 20$, 40 and 60 have been found and $x = 10$ is taken as the basic number. It is pointed out that *A. scaber* ($2n = 40$) is more tolerant of salinity than the diploid *A. officinalis*, from which it does not differ much morphologically; that the hexaploid African species *A. sprengeri* grows in the Natal mountains whereas diploid African species are confined to subtropical areas; and that *A. acutifolius*, a tetraploid evergreen species, occurs in alpine zones whereas the diploid evergreen species are confined to the Mediterranean basin.
Descriptions are given of eight species occurring in Italy, with indications of their distribution, and a key is provided for their identification. Reasons are given for considering *A. scaber* as distinct from *A. officinalis* and as possibly representing an allopolyploid of which *A. officinalis* may be one of the parents. *A. aphyllus* is difficult to distinguish from *A. acutifolius* and crosses between them gave fertile hybrids; many forms intermediate between the two are found and are probably hybrids. On the other hand *A. stipularis* is considered distinct, being a diploid with $2n = 20$, though introgression seems to have occurred between this species and *A. aphyllus* and *A. acutifolius*.

4365 Röbbelen, G.
Beiträge zur Analyse des *Brassica*-Genoms. (**Contributions to the analysis of the *Brassica* genome**).
Chromosoma 1960 : **11** : 205–28.

Pachytene chromosomes of *B. campestris* ($n = 10$), *B. oleracea* ($n = 9$) and *B. nigra* ($n = 8$) are described. In each species the same six types of chromosome could be distinguished. *B. campestris* has the chromosome formula AABCDDEFFF, *B. oleracea*, ABBCCDEEF and *B. nigra*, ABCDDEFF. Secondary pairing was observed in a triploid hybrid of *B. oleracea* and *B. campestris* indicating some homology in chromosomes from different genomes. Also secondary pairing occurred in pachytene and metaphase I and II between duplicated chromosomes within genomes.

4366 Lukovnikova, G. A.
(**Variation in quantity and quality of nitrogenous substances in species and cultivars of cabbage**).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1959 : **32** : No. 3 : 149–58. [Russian].

The content of crude protein varied from 1·23% in cabbages to 5·34% in Brussels sprouts and the content of dry matter from 14·9 to 28·7%. Differences were also detected between cultivars, the maximum difference for protein amounting to 1·4% in cauliflowers and 0·6% in cabbage. In general the highest values were found in late-maturing varieties but differences were observed between geographical groups; thus among the cauliflowers the highest values were found in the Italian cultivars and among the cabbages in those from western Europe.
The proteins predominated over the nonproteins in the nitrogenous constituents of cauliflower and cabbage whereas the reverse was true in the kohl rabi. Most of the nitrogenous fraction in all species was soluble in salt; the proteins are easily digestible and contain the chief aminoacids required for human nutrition.

4367 Lizgunova, T. V.
(**The history of botanical studies of the cabbage, *Brassica oleracea* L.**).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1959 : **32** : No. 3 : 37–70. [Russian].

References to Raphanus and Crambe by Greek authors such as Aristotle and Theophrastus are thought to apply to *Crambe maritima*, or some allied species, as well as to kales belonging to *B. oleracea* and the wild *B. cretica*. Roman authors described both cabbages and kales and possibly, under the names Olus Pompejanum and Cyprianum, also broccoli, whilst Olus Halmyrdianum is thought to have applied to some form of *Crambe* sp. Arabic authors of the 12th century referred to cabbage and cauliflower in Spain, though western European authors made no mention of the cauliflower until it was described by Dodonaeus (1583) and Lobelius (1581). An outline of the classifications presented by succeeding authors shows that the confusion surrounding the classification of many forms, particularly the kales and Savoy cabbages, was not resolved by the systems either of Linnaeus or his successors such as Duchesne, A. P. de Candolle or Alefeld. Many of the systems proposed by taxonomists of the 20th century repeat the defects of their predecessors, in particular in the inadequate attention given to wild species and to the forms cultivated in the Mediterranean, south-eastern Europe, Russia and Asia. Material from these areas has been studied at the Institute of Plant Industry in Leningrad and on the basis of this study kale, cauliflower, headed cabbage, Savoy cabbage and kohl rabi have been recognized as separate, though closely

related, species. They are thought to be derived probably from different wild species and are adapted to different sets of ecological conditions; crosses between them give complex segregation of the type associated with interspecific hybrids. Within the headed cabbage, *B. capitata*, three subspecies are established, ssp. *mediterranea*, ssp. *orientalis* and ssp. *europaea*, the first containing headed and semi-headed forms as well as the veined (tronchuda) cabbages of the Iberian peninsula. *B. cauliflora* is given two subspecies, ssp. *simplex* and spp. *abortiva*, the former with branched heads and the latter with compact white heads. Two subspecies are recognized also in *B. sabauda*, ssp. *decapitata* and ssp. *eucapitata*, the former being without heads or semiheaded and being closely related to the wild cabbage; *B. caulorapa* has ssp. *asiatica* and ssp. *occidentali-europaea*, and *B. subspontanea* (kales) has ssp. *planifolia* and ssp. *crispifolia*, the former being most closely related to the wild cabbage and the latter distinguished by great frost resistance.

4368 Szklarski, A.
**Badania nad ulepszeniem metody hodowli kapusty wczesnej. (Studies on an improved method of breeding early cabbage).**
Biul. Warzywniczy. 1959 : **4** : 407–24.

Cabbage plants kept in pots or boxes over the winter and planted out the following spring gave good yields of seed but selection had to be carried out under different conditions from those under which the cabbage would normally develop. Experiments were therefore carried out on the production of seed from plants after the heads had been removed. Several methods were compared, consisting in keeping the stump under various conditions through the winter and taking cuttings from it by different methods and at different times. Better results were obtained when only 2–3 buds were left to develop and the best of all when the cuttings were rooted in the autumn and planted out the following spring, in which case a yield of 13·9 c. of seed per ha. was produced.

4369 Thompson, K. F. & Howard, H. W.
**Self-incompatibility in marrow-stem kale, *Brassica oleracea* var. *acephala*. II. Methods for the recognition in inbred lines of plants homozygous for S alleles.**
J. Genet. 1959 : **56** : 325–40.

Methods of recognizing homozygotes for *S* alleles in inbred families from parents heterozygous for alleles which may have four possible dominance relations are discussed and the successful application of these methods is described [cf. XXVI, 3516]. The four possible relationships between the parental *S* alleles are as follows: (1) allele *a* is dominant to *b* in both pollen and style; (2) *a* is dominant to *b* in the pollen but both alleles are active in the style; (3) both *a* and *b* are active in the pollen but *a* is dominant to *b* in the style; and (4) both alleles are active in both pollen and style. Self-compatible individuals in the inbred progeny of self-incompatible plants may be homozygous either for an *S* allele low in the dominance series or for a recessive allele independent of the *S*-allelic system. Female sterility may be due to genes in the same linkage group as the *S* alleles or independent of this system. Pseudocompatibility occurred in many families but it was possible to ignore it in the analysis.

4370 Honma, S.
**Spartan Early—a new variety of broccoli.**
Quart. Bull. Mich. St. Univ. agric. Exp. Sta. 1960 : **42** : 470–73.

Spartan Early is a heading broccoli obtained by bulking two closely similar, cross-compatible inbred lines with good combining ability, which were derived from Green Mountain. Compared with the parent variety, it has the advantages of earlier maturity, uniformity in time of maturity of the central heads, higher yield and better freezing quality. It has displayed wide adaptability in Michigan and other states.

4371 Natti, J. J. & Atkin, J. D.
**Inheritance of downy mildew resistance in broccoli.**
Phytopathology 1960 : **50** : p. 241. (Abst.).

Using a selection of PI189028 as the resistant parent and a selection of Waltham 29 as the susceptible parent, it was shown that resistance to *Peronospora parasitica* is controlled by a single dominant gene. A breeding programme to develop a downy-mildew resistant broccoli of the Waltham 29 type has progressed to the fifth back-cross stage.

4372 Cole, K.
**Inheritance of male sterility in green sprouting broccoli.**
Canad. J. Genet. Cyt. 1959 : **1** : 203–07.

A male-sterile mutant of *Brassica oleracea* var. *italica* is reported. Male sterility was found to be controlled by a single recessive gene, *ms*.

The glossy foliage of the mutant, which is controlled by the recessive gene *gl*, is not linked with the male-sterile character.

4373 North, C. & Priestley, W. G.
**Problems in breeding Brussels sprouts (*Brassica oleracea gemmifera*) at Mylnefield.**
Heredity 1960 : **14** : p. 221. (Abst.).

Attention is drawn to problems of breeding at the Scottish Horticultural Research Institute, Mylnefield, Dundee. Among the topics mentioned are (1) the techniques in use, e.g. the objective measurement of sprout firmness mechanically and (2) exploration of the possibility of utilizing ♂-sterile lines to produce $F_1$ hybrid seed, together with study of the inheritance of this condition.

4374 Ellis, J. R. & Janick, J.
**Chromosome elimination in a trisomic of *Spinacia oleracea*.**
J. Hered. 1959 : **50** : 272–74.

A sectorial chimera is described which involved both roots and shoots and arose through a difference of one chromosome, due to elimination of the extra chromosome in a chromosome-4 trisomic [cf. 3271].

4375 Albu, E.
Cercetări asupra cîtorva soiuri de salată potrivite pentru forţat în răsadniţă. **(Investigations on some lettuce varieties suitable for forcing).**
Grădina Via Livada 1959 : **8** : No. 5 : 8–9. (Abst.).

[Cf. 3275].

4376 **Four lettuces released.**
Agric. Res., Wash. 1960 : **8** : No. 9 : p. 16.

Vanguard, Golden State C, Golden State D and Climax have been released by the US Department of Agriculture and California Agricultural Experiment Station. All four are large headed, slow bolting and tipburn resistant. Climax is well adapted as a winter crop in the Imperial Valley of California, producing larger heads and retaining its colour better than other varieties. Golden State C and D are similar to the sister varieties released in 1959 [cf. XXIX, 812]. Vanguard is outstanding for its high quality and good shape.

4377 Lindqvist, K.
**Cytogenetic studies in the *serriola* group of *Lactuca*.**
Hereditas, Lund 1960 : **46** : 75–151.

Observations are reported on the morphology, cytology and fertility of pure lines of *L. sativa*, *L. serriola*, *L. saligna* and *L. virosa* and of intraspecific and interspecific hybrids involving these species. On the basis of the results of crossing, the four species are classed into three ecospecies: *L. sativa-serriola*, *L. saligna* and *L. virosa*. *L. sativa* and *L. serriola* were completely cross compatible. *L. sativa* or *L. serriola* could be crossed with *L. saligna* only when the last-mentioned species was used as ♀, but could be crossed with *L. virosa* in both directions. It was not possible to cross *L. saligna* and *L. virosa*. Lines within each ecospecies differed with respect to complementary genes which were responsible for inviability or dwarfness of interspecific hybrids. Only small differences in chromosome morphology were detected between *L. sativa*, *L. serriola* and *L. saligna*, but the chromosomes of *L. virosa* were markedly different. Within *L. sativa*, *L. serriola* and *L. saligna*, disparities in satellite size were observed between lines. Somatic chromosome doubling was a feature of hybrids between *L. saligna* and *L. sativa* or *L. serriola*. Nonreduction at meiosis, but not somatic doubling, was noted in hybrids between *L. virosa* and *L. sativa* or *L. serriola*. Fertile diploid derivatives were secured from crosses of *L. saligna* with *L. sativa* or *L. serriola*, but not from those of *L. serriola* or *L. sativa* with *L. virosa*. The effect of recessive genes with a deleterious effect on meiosis and on seed setting simulated a slight inbreeding depression in *L. sativa*. Partial pollen sterility, not connected with any meiotic irregularities, was found in hybrids within *L. sativa* and between *L. sativa* and *L. serriola*. This sterility was associated with abnormal segregation of certain genes.

4378 Haber, A. H. & Luippold, H. J.
**Action of 6-(substituted) purines on mitotic activity in "dormant" lettuce seeds.**
Physiol. Plant. 1960 : **13** : 298–307.

"At a concentration of $5 \times 10^{-5}$ M, 6-benzylthiopurine, 6-benzylaminopurine, and kinetin accelerate mitosis and cell division in radicles of nongerminated lettuce seed. The same concentration of adenine or 6-mercaptopurine has no effect on mitotic activity, and $10^{-3}$ M 6-mercaptopurine may be slightly inhibitory. Under conditions for which kinetin and its analogs stimulate mitotic divisions in the nongerminated seeds, they do not alter the relative frequencies of figures observed in prophase, metaphase, anaphase, and telophase and do not cause cytological abnormalities. The yield of radiation-induced chromosomal aberrations in

seedling root tips was unaffected by sowing $\gamma$-irradiated seeds on kinetin. These results indicate that kinetin cannot accelerate cell division by serving as a source of adenine to sites within the cell, and that it seems to 'trigger' the onset of mitotic division in interphase cells but does not affect the course of mitosis once it has begun or otherwise act directly on the chromosomes."

[Authors' summary].

4379 Sandu-Ville, C. & Lazăr, A.
**Contribuţii la studiul ciupercii *Sclerotinia minor* Jagg. parazită pe salată. (Contributions to the study of the fungus *S. minor* Jagg., a parasite of lettuce).**
Stud. Cercet. şti., Biol. Şti. agric. Iaşi 1959 : **10** : 365–70.

These researches included a test of the relative resistance of some Rumanian and introduced varieties to artificial inoculation. The most resistant variety was Crystal.

4380 Fernandes, R. & Fernandes, A.
**Contribuição para o conhecimento das Cucurbitaceae da Guiné Portuguesa. (Contribution towards the knowledge of the Cucurbitaceae of Portuguese Guinea).**
Garcia de Orta 1959 : **7** : 741–53.

Species of *Melothria, Adenopus, Lagenaria, Luffa, Momordica, Cucumis, Citrullus, Coccinia, Trichosanthes* and *Cayaponia* are described and a key to their identification is presented. The forms described include a wild melon, *Cucumis melo* var. *agrestis*, which grows in dry places, particularly in cultivated fields. Several other species are found growing wild as escapes from cultivation.

4381 Balašev, T. N.
**(Varietal types of European melons).**
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1959 : **32** : No. 3 : 233–46. [Russian].

Previous classifications of *Cucumis melo* are reviewed. On the basis of a study of some 400 cultivars of cantaloupe melons, a key is provided for separating them into 13 varietal types, the characteristic features of which are then described. Each varietal type comprises a number of cultivars.

Similar keys and descriptions are given (*a*) for the Russian melons, of which three groups are distinguished, the early Russian melons, the European summer melons and the winter melons respectively, with varietal types within the groups; and (*b*) for the Rockyford melons, which are divided into 7 varietal types; the Rockyford melons may have originated by hybridization between the cantaloupes and the Kasaba melons.

4382 Morrison, G.
**Hybridized watermelon seeds for solid-flesh seedless watermelons.**
Seed World 1959 : **85** : No. 10 : p. 6, 8, 10.

By crossing normal, diploid plants with colchicine-induced tetraploids, the Tri–X series of triploid, seedless water melons has been developed, whose solid-fleshed fruits are said to be of excellent flavour. This work is being carried out by the American Seedless Watermelon Seed Corporation, Goshen, Indiana.

4383 Chopra, V. L. & Swaminathan, M. S.
**Induction of polyploidy in watermelon.**
Proc. Indian Acad. Sci. : Sect. B 1960 : **51** : 57–65.

Germinating seeds and seedlings of the varieties Asahi Yamato [Japanese Rising Sun] and Farrukhabadi were subjected to colchicine treatments at the Indian Agricultural Research Institute, New Delhi. Treatment of seedlings at the cotyledonary stage by the drop method with the colchicine emulsion devised by Warmke and Blakeslee resulted in the highest percentage (38·59%) of $4x$ and mixoploid plants. The tetraploids ($2n = 44$) had the usual gigas features associated with autopolyploidy. The mean frequency of quadrivalents at metaphase I was 5·91. One PMC with $11_{IV}$ was observed. Seed fertility was considerably reduced. The one fruit obtained from crossing $4x$ and $2x$ Farrukhabadi contained 67 seeds, which germinated only upon removal of the testa. The single triploid setting fruit contained many embryoless seeds. Problems in the commercial production of $3x$ water melons are discussed.

4384 Salokangas, K.
Tuloksia avomaankurkun lajikekokeista. **(Results of outdoor cucumber variety trials).**
Koetoiminta ja Käytäntö 1959 : **16** : 13, 16.

A number of varieties are compared for yield, size of fruit, proportion of seeds and spotting of leaves and fruit. Spångberg gives the highest yield, but has comparatively small fruits. Cavallius is much lower yielding than other varieties but has the largest fruits and a small

proportion of seeds. Superb OE and Favor W combine good yield with large fruits and low seediness and are also least susceptible to leaf and fruit spot. The former variety is the most highly recommended.

4385 Popa, D.
Studiul soiurilor de castraveţi pentru sere şi răsadniţe. (**A study of cucumber varieties for greenhouses and hotbeds**).
Grădina Via Livada 1959 : **8** : No. 5 : p. 7. (Abst.).
Varieties best suited for these purposes in trials held during 1956–58 at the Popeşti-Leordeni state farm and the Băneasa experimental station are reported.

4386 Iordăchescu, C.
Studiul unor soiuri de castraveţi cultivate în cîmpia Dunării. (**A study of some cucumber varieties grown in the Danubian plain**).
Grădina Via Livada 1959 : **8** : No. 5 : 17–18. (Abst.).
Varietal tests at Ţiganeşti and Mărculeşti during 1956–58 are recorded.

4387 Nuttall, V. W.
**Cucumber breeding. Aim is to lower growers' costs.**
Res. Fmrs., Ottawa 1960 : **5** : No. 2 : 11–12.
Breeding for resistance to bacterial wilt, scab and mosaic and study of the possible use of ♂-sterile parents in the production of $F_1$ hybrids are in progress at the Central Experimental Farm, Ottawa. Other problems, such as suitability for mechanical picking and improved quality, requiring attention by the breeder in the near future, are indicated.

4388 Aleksandrov, A. V. & Boos, G. V.
(**Utilizing the diversity of open-air cucumbers in breeding and horticulture**).
Trud. priklad. Bot. Genet. Selekc., Sborn. Puškinskih Lab. (Bull. appl. Bot. Gen. Pl.-Breed. Works of Puškin Lab.) 1958 : No. 1 : 257–72. [Russian].
On the basis of observations on 256 varieties grown in hot frames in the open in the vicinity of Leningrad and also in greenhouses, the characteristics of the varieties received from different countries are outlined; special mention is made of the Chinese and Japanese varieties, many of which develop parthenocarpic fruits, the Japanese being also possessed of great disease resistance.
The most promising varieties have been subjected to inbreeding and intercrossing and a number of new varieties produced in this way are listed and described. These include Dlinnoplodnyj 1294 [Long-fruited 1294], a selection from a Chinese cucumber, which has yielded 26 kg. of fruit per m². in hothouses in Leningrad. Promising varieties have been produced by selection from German cucumbers, from Spot-resisting and other English varieties, from Japanese cucumbers or from Chinese forms obtained through France, the USA or elsewhere. The best varieties to use for breeding for different purposes are indicated and some data are given concerning the most successful hybrids that have been produced by intervarietal crossing; some of them have given yields of up to 30 kg. per m²., the highest yields being from hybrids in which Klinskij 2137 or Klinskij 1545 served as seed parent. Most of the hybrids produced their fruits earlier in the season than the parental forms so that although their total yield exceeded that of the Klinskij parent by 15–71%, the yield produced by 1 June exceeded it by 32–117%.

4389 Boos, G. V.
(**Prospects of breeding and seed production of cucumbers in the north west of the USSR**).
Trud. priklad. Bot. Genet. Selekc., Sborn. Puškinskih Lab. (Bull. appl. Bot. Gen. Pl.-Breed. Works of Puškin Lab.) 1958 : No. 1 : 273–78. [Russian].
Data are presented showing that the existing cucumber varieties in the Soviet Union do not give satisfactory yields when grown in the open in the vicinity of Leningrad; the main characteristics of the different varieties are outlined, with indications of the varieties considered most promising for use as parents in breeding for earliness, yield, disease resistance and nutritive qualities.

4390 Govorov, N.
(**A hybrid cucumber**).
Nauk. pered. Opyt sel'sk. Hozjajstv. (Sci. progr. Exp. Agric.) 1959 : No. 4 : 46–47. [Russian].
The heterotic hybrid Uspeh 221 [Success 221], from Krymsk, Krasnodar territory, is earlier and more productive than Nežin, without being inferior to it in quality. The hybrid is obtained by growing Posrednik 97, which has 75% ♀ flowers, in alternate rows with Rustem 96–1.

4391 Boos, G. V.
**(On classification of the cucumber).**
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1959 : **32** : No. 3 : 80–86. [Russian].

Certain criticisms of the system of classification proposed by Gabaev [III, 281] are offered. His species *Cucumis sphaerocarpus* is considered to be only a subspecies of *C. sativus*, the English long-fruited cucumbers are regarded as belonging to the east-Asiatic ssp. *rigidus*, the cucumbers of the Soviet Far East are considered to belong to a separate variety and ssp. *agrestis* is unjustified as no cucumber is yet known in the wild state. A revised form of Gabaev's classification is therefore presented, in which *C. sativus* is divided into three subspecies, ssp. *rigidus*, ssp. *gracilis* and ssp. *sphaerocarpus*, the first two being further subdivided into varieties, established on the basis of their morphological and physiological features and geographical origin. Indications are given of the cultivars comprised in the respective varieties.

4392 Garde, A.
**The effect of ionizing radiations on quantitative variation in plants. I. Uptake and distribution of radioactive phosphorus within the seed and plants of *Lycopersicon*.**
Genet. iber. 1959 : **11** : 217–49.

Germination was delayed when seeds were soaked in 0–3% $P^{32}$ solutions, partially inhibited in 3–7% solution and completely inhibited above 7%. When removed to water, however, inhibited seeds were able to germinate normally, even after 90 days in inhibitory solutions. This method may thus be useful in subjecting material to high levels of radiation. Temporary inhibition was induced by treatment of seeds partially germinated in water, germination being resumed when the seeds were returned to water. The quantity of $P^{32}$ in the flowers decreased from the base to the tip of the inflorescence. Differences in visible pollen abnormalities were also observed in different parts of the inflorescence.

4393 Savinova, N. & Popa, D.
Soiuri de tomate indicate pentru sere şi răsadniţe. **(Varieties of tomato recommended for greenhouses and hotbeds).**
Grădina Via Livada 1959 : **8** : No. 5 : p. 8. (Abst.).

The results of variety trials at the Băneasa experimental station in 1957 and at the Popeşti Leordeni state farm in 1958 are reported.

4394 Tălpălaru, E., Savinova, N., Löbl, D. & Popa, V.
Noi soiuri de tomate de perspectivă. **(New promising varieties of tomato).**
Grădina Via Livada 1959 : **8** : No. 5 : 14–15. (Abst.).

Trials of varieties introduced from Bulgaria, England, Germany, Hungary, Italy, the USA and the USSR at the Ţigăneşti and Băneasa research stations and the 30 Decembrie state farm during 1956–58 are reported.

4395 Lyall, L. H.
**Breeding tomatoes for modern needs.**
Res. Fmrs., Ottawa 1960 : **5** : No. 2 : 6–7, 10.

A popular account is given of breeding for earliness, fruit colour, resistance to diseases and fruit defects and suitability for mechanical harvesting, now in progress in Canada.

4396 Adolf Frembgen 65 Jahre alt. **(Adolf Frembgen 65 years old).**
Saatgutwirtschaft 1960 : **12** : p. 141.

Mention is made of the activities of this breeder who developed the valuable tomato variety Rheinlands Ruhm [Rhineland Fame].

4397 Henderson, W. R.
**Cause and mode of inheritance of male sterility in four mutants of tomato (*Lycopersicon esculentum* Mill.).**
Diss. Abstr. 1959 : **20** : LC Card Mic 59–2741 : 462–63. (Abst.).

The four mutants were found in Purdue, Red Jacket, Ohio W–R Jubilee and Big Early Hybrid and depended upon *bn*, $cl_3$, *sl*(?) and *ps*(?) respectively. Probably *ps*(?) was identical with the gene responsible for the *ps* mutant described by Larson and Paur. The genes *bn*, $cl_3$ and *sl*(?) each segregated independently of *c* (potato leaf shape) and *u* (unripe fruit colour). The *bn* mutant usually bore stamenless flowers. Unfruitfulness in the $cl_3$ mutant was attributed to a premature exsertion of the stigma. Stamen number was reduced in the *sl*(?) mutant. Other features associated with sterility in these three mutants were probably the result of the pleiotropic action of *bn*, $cl_3$ and *sl*(?).

4398 Kemp, G. A. & Nonnecke, I. L.
**Differences in intensity of unripe fruit colour in the tomato.**
Canad. J. Pl. Sci. 1960 : **40** : 306–09.

Differences in the intensity and pattern of the green colour of the unripe fruits of Danmark, Earlinorth, Early Lethbridge, Uniform Globe

and Firesteel and of the $F_1$ hybrids between these varieties were evaluated visually and with a reflectance meter. The differences were greater than could be explained on the basis of the two known nonallelic genes *U* and *Ug*. Possibly an allele of *U* or *Ug*, or, more likely, a third gene influences green fruit colour.

4399 Butler, L.
**The linkage map of chromosome 2 of the tomato.**
Canad. J. Bot. 1960 : **38** : 365–79.

Data accumulated over the past 30 years are analysed. Mapping of chromosome 2 (former linkage group 1) presents many difficulties because of the lethality of *Wo* (woolly) and reduced viability of *ro* (rosette), *dv* (dwarf virescent) and *m* (mottled leaves). The phenotypic classification of *o* (ovate fruits), *bk* (beaked fruits) and $ms_{10}$ (male-sterile 10) also presents difficulties. Examination of the monogenic ratios has shown that many are disturbed because of lethality, reduced viability and misclassification but that these factors do not account for all the discrepancies. In the case of *Wo* and *aw* (without anthocyanin), there are large excesses of the dominant class. This evidence, along with data from anomalous recombination values, is indicative of a chromosomal abnormality. It is suggested that this abnormality is a duplication which in some stocks results in two *Wo* loci about 25% apart and two *aw* loci less than 40% apart, and which also involves *Me* (mouse ears) and *Cu* (curled leaves). According to the recombination values, the map is *dv* 3 *m* 2 *d* 4 *p* 10 *aw* (*ps o ro*) 13 *Me* (*Cu bk*) 4 *Wo* 2 $ms_{10}$ 5 *s*. The five genes within the brackets are in the positions indicated but the recombination values within each bracket are not known. Although this linear order gives the best agreement with the 61 recombination values, some discrepancies may be noted. The *aw ps* and *aw o* values, which should be less than 10%, are over 40%, and the *ps o* value, which should be 3%, is 26%. Significant differences of more than 10% have also been found between sets of data for the same pair of genes, this finding being another indication of chromosomal alteration.

4400 Gusev, P. P. & Guseva, N. A.
**(Heterosis in tomatoes and its use in the conditions of the extreme north).**
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1959 : **32** : No. 3 : 133–38. [Russian].

Observations were made on 151 hybrid combinations grown in unheated block greenhouses during the period 1952–57. Of these, 103 exceeded both parent varieties in yield, 23 exceeded one parent and 25 were inferior to both parents. Tabular data are given showing the total yields and the yields of early fruit in the best hybrids, which exceeded the standard, King of Earlies, as well as both parents. The greatest increases in yield were found in hybrids between varieties that differed in morphological and physiological characters and in place of origin. This applied to most combinations involving the variety Altajskij 2308 [Altaj 2308]; thus the hybrid Altajskij 2308 x Gruntovyj Gribovskij 1969 [Gribovo Outdoor 1969] exceeded the standard by 59–68% and the parents by 30–59%. One hybrid, Korneev 2671 x Hibiny 66 (Bison 1962/19 x Gruntovyj Gribovskij 1969) exceeded the standard by 80%, giving 7·9 kg. of fruit per m². The mean increase over the parental yield was 25–30%. Only one of the 25 hybrids in question exceeded both parents in fruit size though 23 of them exceeded one of the parents.
The greatest improvements from crossing were observed in years with a cold, protracted spring. The hybrids were regularly more resistant to diseases such as *Sclerotinia* and their fruit was higher in content of sugars and vitamin C.

4401 M., U. & V., E.
**(Scientific conference at the 'Marica' Horticultural Research Institute in Plovdiv).**
Selskostopan. Misăl 1959 : **4** : 383–84. [Bulgarian].

Breeding improved varieties of tomato, sweet pepper, cucumber and cabbage at the above institute and its branches was discussed at a recent conference in Plovdiv. Other topics included horticultural methods and varietal testing procedures. The results referred to include the new hybrid tomato varieties Zarja [Dawn] x Kecskemét and Kecskemét x Rutgers with superior canning properties to Rutgers and Plovdiv 14 and a new sweet pepper Bjala Kapija [White Gate] which is 20 days earlier than Pazaridžiška Kapija [Market Gate] and outyields this by 19%.

4402 Williams, W. & Gilbert, N.
**Heterosis and the inheritance of yield in the tomato.**
Heredity 1960 : **14** : 133–49.

Data were obtained on the yield, fruit number, fruit weight and flowering date of 153 $F_1$ hybrids resulting from diallel crossing of 18

varieties, the hybrids being studied under both glasshouse and field conditions at the John Innes Horticultural Institution, England. The criterion of heterosis was superiority over the better parent. It is concluded that the greater part of the average heterosis for yield was merely due to the relative distribution of the values of the components of yield in the parents of a given cross [cf. 996 and 3294]. Instances of heterosis for yield in crosses in which the components of yield were not heterotic are described. The view is expressed that it is thus erroneous to speak of heterotic genes for complex characters such as crop yield and that, in naturally inbreeding species, many other characters affected by heterosis probably behave in a manner similar to yield in the tomato. Heterosis for each of the four characters was mainly confined to crosses between parents which were below the maxima in the range of variation for the particular character in question. Nearly maximum values for the expression of yield have apparently been fixed by selection in the pure-breeding varieties falling within the upper ranges of variation and these values are not exceeded by heterotic hybrids between parents with a poorer performance. The behaviour of the entire range of $F_1$ hybrids may be interpreted according to the assumption of a controlling system based on the action of complementary genes with varying degrees of dominance. "In the Appendix it is shown that statistical interactions between parents fluctuate from generation to generation; that the discrepancy between yield of parent and its general combining ability cannot yet be ignored; and that parents transmit variability of performance, as well as average performance, to their offspring."

4403 Ivanova, K. V.
**(On *Lycopersicon hirsutum* H.B. et K.).**
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1959 : **32** : No. 3 : 71–79. [Russian].

The forms of the species described include one from the vicinity of Lima, Peru, described by C. H. Muller as a separate species, *L. glandulosum* [XI, 224]; forms corresponding to the description of this species have been found in progenies from the cross *L. esculentum* x *L. hirsutum*.

Crosses with *L. hirsutum* introduced from the USA confirmed the findings of investigators there, that the cross *L. esculentum* x *L. hirsutum* is successful but the reciprocal is not. Most of the characters of *L. hirsutum* were dominant in the $F_1$ and many $F_2$ plants also resembled that parent but a wide range of fruit colours was observed. Fertility was low in the early generations but increased progressively; in the $F_4$ several plants of the cultivated type with fruits weighing 40–60 g. appeared, though a number of sterile plants were also present. Cultivated types appeared sooner when pollination was effected with a pollen mixture containing some maternal pollen. In back crosses of the $F_1$ to *L. esculentum* marked heterosis occurred in respect of vegetative vigour and the plants showed greater resemblances to *L. esculentum*, though a great number of back crosses were necessary to establish constant forms, which resulted in the loss of much, though not necessarily all, of the disease resistance derived from *L. hirsutum*.

4404 Mathan, D. D. & Jenkins, J. A.
**Chemically induced phenocopy of a tomato mutant.**
Science 1960 : **131** : 36–37.

A dominant heterozygous leaf-shape mutant termed lanceolate bears elongated, simple and entire leaves and has the associated characters of small fused cotyledons, early appearance of axillary shoots, leafy inflorescence and reduced flower size. When homozygous, the gene in question results in a "narrow" or "reduced" phenotype, the former having the appearance of an extreme lanceolate type, while seedlings of the latter do not develop beyond a cylindrical mass of green tissue, the cotyledons and plumule being absent. Adenine or a diffusate from normal seeds stimulated the development of cotyledon-like structures and of growing points in seedlings of the reduced phenotype, the seedlings giving rise to plants which constituted a phenocopy of the narrow type.

4405 Clayberg, C. D.
**Cytogenetic studies of precocious meiotic centromere division in *Lycopersicon esculentum* Mill.**
Genetics 1959 : **44** : 1335–46.

A partially sterile mutant which appeared in a field planted with a commercial tomato variety, Earlypak, produced a few seeds which gave rise to a family containing both fertile and pollen-sterile individuals. The almost complete sterility was found to be associated with the regular occurrence of precocious meiotic centromere division and to be controlled by a single recessive gene *pc*.

The chromosomes of the mutant first deviate from normal behaviour at anaphase I when some daughter bivalents lag and divide. It is not known exactly when centromere division begins but the centromeres of most chromosomes had divided in all the cells observed by prophase II. At metaphase II all chromosomes were regularly oriented on the metaphase plates; migration to the poles was at random and without further division. A considerable amount of lagging in the second division resulted in the formation of restitution nuclei.
Megasporogenesis was not studied cytologically, but there were indications that meiosis proceeds similarly in both megasporocytes and microsporocytes.

4406 Issako, L.
Sortidevahelise pookimise tulemusi tomatil. **(Results of grafting between tomato varieties).**
Eest. NSV Teadust. Akad. Toimetised : Biol. Seer. 1960 : No. 1 : 47–59.
In studies of Ploomikujuline [Plum-shaped] grafted on to Hübriid 190 [Hybrid 190] and Kuldne kuninganna [Golden Queen] on Punane pirnikujuline [Red Pear-shaped], as well as the reciprocal grafts, no morphological changes were detected in the grafts in the year of grafting. However, in the second and third sexual generations from the scion Kuldne kuninganna on Punane pirnikujuline, morphological and physiological changes were found, and segregation was still occurring in the fifth generation. The changes observed include crimson fruit colour, determinate growth, earliness and, associated with these characters, greater variation in mean contents of dry matter, monosaccharides and vitamin C. Repeated grafts were not more effective than single grafts in inducing alterations.

4407 Suvorov, V. T.
**(The differences between vegetative and sexual hybrids).**
Trud. odess. sel'skohozjajstv. Inst. (Proc. Odessa agric. Inst.) 1957 : **9** : 38–42 : from Ref. Ž. (Ref. J.) 1958 : No. 20 : Abst. 90431 : p. 37. [Russian].
Vegetative hybrids between systematically closely-related forms of tomato showed greater changes by comparison with sexual hybrids in respect of flower, inflorescence and fruit characters. The changes in leaf and stem characters however were less pronounced than in the sexual hybrids.

4408 Lambrev, Ž.
**(Vegetative hybrids between plum-shaped and pear-shaped tomatoes).**
Agrobiologija (Agrobiology) 1959 : No. 3 : 416–18. [Russian].
The fruit characteristics of the first and second seed generations of the above vegetative hybrids have been studied at Plovdiv, Bulgaria, differences in the mode of segregation between the plants given large or small amounts of nutrients and moisture being noted. The percentages of plum-shaped and pear-shaped fruits on a plant depended on the time of picking, most first fruits being plum-shaped. Among the fruits picked later the proportion of pear-shaped fruits rose perceptibly.

4409 Ötvös, Z.
Rezultate preliminare privind cultura comparativă a unor linii de tomate. **(Preliminary results on the comparative culture of some tomato lines).**
Grădina Via Livada 1959 : **8** : No. 5 : 16–17. (Abst.).
Some high-yielding tomato lines have been selected from a [presumably vegetative] intergeneric hybrid between tomato and *Capsicum* effected by R. Palocsay [cf. XXIX, 617].

4410 Wróblewska, Z.
Kolekcja pomidorów Zakładu Warzywnictwa w Puławach—lata 1954–1956. **(The tomato collection of the vegetable production division in Puławy in 1954-1956).**
Biul. Warzywniczy. 1959 : **4** : 17–25.
Comparisons were made of varieties in three groups: (1) bush (2) self-pruning and (3) tall types. Special mention is made of the Bulgarian variety Plovdivskaja Konservna [Plovdiv Processing], which had a mean dry-matter content of 7·32% over a three-year period.

4411 Iannaccone, A.
Pomodoro da tavola : le varietà. **(Table tomatoes : the varieties).**
Agricoltura, Roma 1960 : **9** : No. 5 : 31–36.
Statistics are given on the production of table tomatoes in different parts of Italy and Sicily. Most of the varieties grown are round-fruited forms introduced from abroad, the local strains being mostly ribbed. Though these latter are not favoured in the export market, they have many notable advantages such as earlier ripening, greater disease resistance and freedom from splitting.

4412 MARTIN, P.
La culture de la tomate en serre. (**Greenhouse cultivation of the tomato**).
Rev. Oka 1960 : **34** : 19–27.
Varieties suitable for growing in the Quebec region of Canada are listed together with short notes on their appearance, maturity and disease reaction.

4413 BARBIERI, R.
Pomodoro da industria: le varietà. (**Industrial tomatoes: the varieties**).
Agricoltura, Roma 1960 : **9** : No. 5 : 53–60.
Statistics are given on the cultivation of tomatoes for various industrial purposes in different parts of Italy, the cultivars grown and their yields. Those for peeling largely comprise S. Marzano, Lampadina and selections from them. Many more cultivars are used for preparing concentrates and these include a number of recent selections and hybrids; a record yield of 1300 c. per ha. is mentioned for Prospero 39. The attention of plant breeders is called to the need for varieties specially designed for the production of tomato juice, with higher contents of sugar and vitamins, lower acidity and cellulose content and better colour, in all of which respects the local tomatoes of southern Italy are superior to the large-fruited northern varieties; they are also short and do not require staking. Being genetically heterogeneous, they offer promising material for selection.

4414 GOTTSCHALK, W.
Meiotische und prämeiotische Abregulierung. (**Meiotic and premeiotic reduction**).
Z. Bot. 1960 : **48** : 104–25.
Many of the 39 tetraploid and octoploid tomato plants investigated showed the meiotic processes leading to a reduction in chromosome number which have been described in earlier papers [cf. XXVIII, 4844 and 4845 and XXX, 2051]. Less frequent were processes hitherto unknown and involving the separation of one or two genomes from a large association of chromosomes during anaphase I; this was observed mainly in PMCs with a high chromosome number. The frequency of PMCs with a reduced chromosome number was very low in tetraploids but in some octoploids it approached 10%. Premeiotic reduction usually occurred in the last mitosis before meiosis. In a few cases diploid PMCs were formed and these underwent a normal meiosis. Both $4n$ and $2n$ PMCs were produced in octoploid anthers.
The progeny of tetraploid plants were always tetraploid and showed the same reduction processes as the mother plants. An investigation of pachytene in a few PMCs revealed that complete genomes had been separated in the reduction process.

4415 ROSS, J. G. & HOLM, G.
**Somatic segregation in tomato.**
Hereditas, Lund 1960 : **46** : 224–30.
A study was made of somatic segregation in *aurea* mutants ($+A$), which are recognizable by their pale green colour. Seedlings homozygous for the *aurea* gene are yellow and do not survive. The presence of single and contiguous double green ($++$) and yellow ($AA$) spots in *aurea* plants is taken as evidence of somatic segregation for homozygous tissue. The frequency and size of the spots increased as the result of colchicine treatment at the early seedling stage, followed by infrared treatment at 26° C. for 7 days. The ratios of green to yellow and of twin to single spots did not differ between treated and untreated plants. A difference in pollen fertility between treated and control plants was probably indicative of induced polyploidy, but the coefficients of correlation of pollen fertility with frequency and size of spots within the treated group were not significant. Reasons are given for believing that somatic reduction was responsible for the segregation in both treated and control plants.

4416 SOOST, R. K.
**Effects of gibberellic acid on genetic characters in two tomato lines.**
Bot. Gaz. 1959 : **121** : 114–18.
Applications of 30 and 60 $\mu$g. of gibberellic acid per plant to the fourth expanding leaf induced significant increases in stem length in both a normal ($d^+$) and a dwarf ($d$) plant, the normal responding relatively more than the dwarf to 30 $\mu$g. The increase in rate of stem growth resulted in earlier flowering. The determinate, nonleafy inflorescences of both the normal and the dwarf plants became leafy and indeterminate as a result of treatment, as if the recessive gene $lf$ were present. This indicates that the dominant gene $lf^+$ is inhibitory in action and that gibberellin may have an antiinhibitory effect.

4417 Marchesi, G.
**(Earliness of some tomato cultivars on the basis of the three-year period 1956-58).**
Ann. Fac. Agr., Milano 1959 : **76** : 243–54.

Observations on 12 cultivars grown in the vicinity of Piacenza showed the variety Pigmeo [Pigmy] to be the earliest, next in earliness being Pirro, Pancrazio and Pilastro. Of these, Pigmeo is the only cultivar classed as a table variety, the others having ribbed fruits, which commonly puts them in the class of industrial varieties.

4418 Ajzenštat, Ja. S.
**(Influence of pollen of remote species on segregation in intervarietal crosses of tomato).**
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1959 : **32** : No. 3 : 299–303. [Russian].

Pollination of the variety Zolotaja Koroleva [Yellow Queen], having yellow fruit, with a red-fruited form of *Lycopersicon esculentum* var. *cerasiforme* gave an $F_2$ segregation of 2–8 plants with red fruit: 1 with yellow when carried out in the usual way; when the number of pollen grains was limited to 30–35 most of the $F_2$ plants had yellow fruits, though segregation occurred for other characters. Addition of pollen of wild potato, black nightshade or egg plant to the 30–35 grains restored the segregation ratio to normal in most families, though not in all.

4419 Strekalova, A. I.
**(New tomato varieties).**
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1959 : No. 5 : 126–28. [Russian].

Recent accessions to the collection of the Institute of Plant Industry thought to be valuable for immediate introduction or as breeding material are listed. They include varieties introduced from different countries of Europe, Asia and America, recent Soviet cultivars and other specimens collected by the institute on Soviet territory. Information on the growth period, yield and morphological characteristics of many of the specimens is provided.

4420 Syskova, M. V.
**(Comparative estimation of tomato varieties as to their cold resistance).**
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1959 : **32** : No. 3 : 181–92. [Russian].

Observations on 48 cultivars showed that some were able to germinate successfully at 10° C., these being mostly varieties that had been bred in cold regions; some of them germinated even at 4–8° C. Both *Lycopersicon hirsutum* and *L. peruvianum* germinated well at 7–10° C. but *L. esculentum* vars. *eupimpinellifolium* and *cerasiforme* did not.

The varieties, 30 in number, that germinated at low temperature were subjected, after hardening, to temperatures down to —3° C. for 2 hr. and another set to 4–6° C. for 3–4 weeks; the latter treatment had the more adverse effect and the only varieties that resisted it were Urožajnyj 1864 [Productive 1864], Pieretta, Hybrid 25/4, Puškin 1853, Gruntovyj Skorospelyj 01165 [Outdoor Early 01165], Earliana 20 and Štambovyj Karlik 01185 [Dwarf Bush 01185], the last being unable however to tolerate short frosts of even 1° C.

Some varieties lost less fruit than others by the action of low temperatures and those that combined this quality with tolerance of both prolonged cold and brief frost were Urožajnyj 1864, Gruntovyj Gribosvkij 01180 [Gribovo Outdoor 01180], Hybrid 154 and Gruntovyj Skorospelyj 01165.

4421 Šmaraev, G. E.
**(Initial material and methods of growing tomatoes in the lower valley of the Amu-Dar'ja).**
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1959 : **32** : No. 3 : 280–90. [Russian].

The hot dry air of the region through which the Amu-Dar'ja river flows causes the reproductive organs to fall off and the leaves to curl in most tomato varieties; the least affected are the short varieties with determinate growth from southern Russia and also *Lycopersicon esculentum* vars. *eupimpinellifolium* and *cerasiforme*. The short-stemmed varieties gave the best yields of fruit and some of them are mentioned as having dry-matter contents of up to 8% of the fresh weight and others as being free from big-bud virus (stolbur) and fruit rot.

4422 Hrobryh, N. D.
**(The nature of the development of some pathogens on specimens of tomato differing in resistance).**
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1959 : **32** : No. 3 : 270–79. [Russian].

Most forms of tomato, including *Lycopersicon peruvianum* and *L. hirsutum*, could be infected with *Phytophthora infestans* when the spores of an aggressive race were applied to detached leaves or fruits but one form of *L. esculentum* ssp. *subspontaneum* var. *cerasiforme* 'Humboldtii' from Mexico proved immune; two forms of *L. esculentum* var. *eupimpinellifolium* and two of *L. peruvianum* were also classed as immune and several as resistant. The incubation period was longer and the development of the fungus less rapid in the resistant than in susceptible lines.
By infecting whole plants in the greenhouse with a spore suspension of *Septoria lycopersici* it was shown that the incubation period was 9–10 days on Red Currant, *L. peruvianum* and certain other resistant forms, compared with 7–8 days on susceptible forms.
Several selections resistant to *Alternaria solani* also included Red Currant and *L. peruvianum* and on these the incubation period proved to be 4–5 days, compared with 3 on susceptible varieties.
In all cases spore formation was reduced or absent in resistant forms.

4423 Ivanova, K. V.
**[The nature of infection of the tomato by the fungus *Phytophthora infestans* (Mont.) de Bary].**
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1959 : **32** : No. 3 : 169–74. [Russian].

*Lycopersicon peruvianum* and *L. esculentum* var. *cerasiforme* proved to be heterozygous in respect to their reaction to certain races of *Ph. infestans* and must be tested in any given locality before being used there as resistant parents. The results of tests on young and old plants were not always correlated.

4424 Voskan'jan, S. S.
**(Varietal resistance to *Septoria lycopersici* Speg. in tomato).**
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1959 : **32** : No. 3 : 175–80. [Russian].

According to data in the literature the reaction of many varieties differs according to the locality in which it is tested. Observations were made on 1122 cultivars at Majkop in the Caucasus, 211 of them being studied in more detail than the rest. The varieties Stone, Ponderosa and Trophy contained a certain number of plants that were not attacked at all until the end of August, which agrees with the results of other investigators. The most susceptible varieties were also the same as those reported elsewhere but in the intermediate group there were a number of discrepancies.

4425 Olejnikova, T. V.
**(Response of tomatoes to day length and temperature).**
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1959 : **32** : No. 3 : 108–15. [Russian].

The experiments described show that all cultivars but Datskij Êksport [Danish Export] formed flower buds earlier in short days, though the optimum day length and the amount of acceleration differed according to the variety; those from northern Europe and northern Russia could complete their photostage in a 13–14 and even in a natural 18-hour day. Wild forms of *Lycopersicon esculentum* were more sensitive to day length; for *L. peruvianum* the optimum was an 11–12-hour day and for *L. hirsutum* 10 hours. It is therefore concluded that cultivated tomatoes have unconsciously been selected towards a neutral photoperiodic reaction.
All cultivars, as well as *L. peruvianum* and *L. hirsutum*, flowered sooner when grown at relatively high temperatures in the greenhouse up to the time of appearance of the flower buds, whereas some of the semicultivated and wild forms of *L. esculentum*, particularly those from high altitudes in Peru and Colombia, were unaffected by periods of low temperature (13–18° C.) or even hastened their flowering. All forms produced more fruit when subjected to low temperatures during the night and *L. hirsutum*, though it flowered without such treatment, produced no fruits. Low temperature after the buds had formed had much less effect on flowering in all forms.

4426 Ramirez, D. A.
**Cytology of Philippine plants. II. *Solanum grandiflorum* Ruiz and Pav.**
Philipp. Agric. 1959 : **43** : p. 375.

Hybridization between *Solanum grandiflorum* and egg plant offers the possibility of introducing the characters of perennial habit and

disease and pest resistance into the latter species. *S. grandiflorum* proved to be meiotically regular and to have the same number of chromosomes ($2n = 24$) as the egg plant.

4427 Rai, U. K.
**Cytogenetic studies in *Solanum melongena* L. I. Chromosome morphology.**
Caryologia 1959 : **12** : 299–316.

Chromosome morphology was investigated in root-tip cells of Purple Long, White Bunchy, White Round, Purple Oval, Green Oval, Ram Nagar Giant, All the Year Round, a wild form var. *insanum* (two phenotypes) and two intervarietal crosses Purple Long x White Bunchy and White Round x *insanum* (big leaf).
In all varieties $2n = 24$ and two medianly constricted chromosomes bear satellites. The varieties are grouped according to the number of medianly and submedianly constricted chromosomes. In some cells of var. *insanum* (small leaf) an acentric fragment was clearly observed. The maximum number of nucleoli recorded at early telophase was six in Purple Long, White Round, *insanum*, Ram Nagar Giant and the two crosses, and two in White Bunchy, Purple Oval, Green Oval and All the Year Round. In every case a single large nucleolus eventually resulted from their fusion. Somatic chromosome pairing was noted in some cells (20%) of Purple Long; the degree of pairing varied from cell to cell.

4428 Popova, D.
**(Some observations on the flowering, pollination and fertilization of the egg plant).**
Izv. Inst. Rasten. (News Inst. Pl.-Industr.), Sofija 1958 : **5** : 211–30. [Bulgarian].

Five stages of development occur between bud formation and full flowering; the duration of the stages depends on the temperature and the variety. Most flowers are found in the fourth stage and the flowers open mainly in the morning. At 20° C. and 70% humidity, the pollen remains viable for 7–10 days and the stigma remains receptive for 6–8 days. The best fruit set is obtained when the stigmas receive pollen from many different plants. The pollen is most fertile immediately after the opening of the stamens and the stigma is most receptive during the third flowering stage. The number of seed produced increases with the quantity of pollen placed on the stigma.

4429 Joshi, A. B., Singh, H. B. & Joshi, B. S.
**Why not grow Pusa Sawani.**
Indian Fmg. 1960 : **10** : 6–7.

Notable for its resistance to yellow vein mosaic, the okra Pusa Sawani was developed at the Indian Agricultural Research Institute, New Delhi, from a cross between the commercial variety Pusa Makhmali and a resistant type from West Bengal.

4430 Samoggia, V.
Contributo al miglioramento genetico della fava da foraggio (*Vicia faba* sp.). [**Contribution to the genetic improvement of field broad beans (*V. faba*)**].
Sementi elette 1960 : **6** : No. 1 : 11–19.

Seed samples obtained from various localities in southern Italy all proved to be mixed populations, the constituents of which were classified according to plant height and habit, stem diameter, number of leaves and their dimensions, colour of stems, leaves, flowers and seeds, size of pods and seeds, time of maturity and resistance to cold, pests and diseases. After the study of over 1000 individuals, 53 selections were made and are being tested in different parts of Italy. One of them has been released as the variety Vesuvio, distinguished by rapid growth, leafiness and small, black, round seeds suitable for mechanized sowing.

4431 Ruggeri, C.
Gli effetti citologici dell'acetato di cobalto e dell'acetato di nichelio. (**The cytological effects of cobalt acetate and nickel acetate**).
Caryologia 1959 : **11** : 348–57.

Temporary inhibition of mitosis, chromosome fragmentation and other chromosome aberrations were observed in roots of *Vicia faba* grown in solutions of cobalt acetate in concentrations varying from 0·001 to 1·0%; no stickiness or c-mitosis was produced, whereas with similar treatments with nickel acetate these two effects were very pronounced with the more concentrated solutions, the action of the more dilute being similar to that of cobalt acetate.

4432 Moutschen-Dahmen, J. & Moutschen-Dahmen, M.
Transmission héréditaire des lésions chromosomiques dues à la 8-ethoxycaféine. (**The hereditary transmission of chromosome breakages due to 8-ethoxycaffeine**).
Hereditas, Lund 1960 : **46** : 253–60.

Seeds of 30 plants of *Vicia faba* were treated

with 8-ethoxycaffeine and scored for chromosome aberrations at various developmental stages. The aberrations previously noted in root tip cells [cf. XXIX, 138] were also observed in leaf and flower primordia. Chromosome breakages were generally more frequent in primordia than in premeiotic tissues suggesting that some elimination must occur in the latter. However, during meiosis the frequency was found to increase from diacinesis to anaphase I before falling to a low level at anaphase II.
Of ninety plants produced by selfing the treated parents, 43·3% showed chromosome breakages. The distribution of breakages was found to differ significantly from that of the parents, 68·6% of the breakages occurring in the M chromosome, 51·3% being on the nucleolar arm and 6·9% on the other. No morphological changes were observed in the progeny although some individuals showed reduced vigour.

4433 Michaelis, A. & Rieger, R.
Strukturheterozygotie bei *Vicia faba*.
**(Structural heterozygosity in *V. faba*).**
Züchter 1959 : **29** : 354–61.

In a sample consisting of some 10,000 seeds of *V. faba* var. *minuta* 'Kleine Thüringer' [Small Thuringen] two types of translocation, between chromosomes I and III and I and VI respectively, and a pericentric inversion in chromosome V were discovered, the first three times, the second once and the third seven times. Descriptions are given of the normal caryotype and of the three aberrations. Five seeds were obtained from the first translocation heterozygote; one possessed a normal caryotype, two were heterozygous and two homozygous for the translocation. No phenotypic differences could be detected between the three types. At meiosis the heterozygous mutant contained a quadrivalent which assumed the form of a cross during prophase and a chain at metaphase I, and 46·5% of the pollen was deformed. Similar ring formation was observed in the I–VI translocation heterozygote, in which 46·6% of the pollen was deformed. Seeds from this plant comprised two with homozygous translocations; in the homozygotes meiosis was normal. In the heterozygous inversion type pollen formation was normal and both heterozygotes and homozygotes were phenotypically similar to the normal plants.
It is hoped that the use of these translocation types in crossing will make it possible to build up lines of *V. faba* in which the five pairs of small chromosomes are distinguishable morphologically.

4434 Riedel, I. B. M. & Wort, D. A.
**The pollination requirement of the field bean (*Vicia faba*).**
Ann. appl. Biol. 1950 : **48** : 121–24.

It is shown that, when pollination is inadequate, increased yields by the upper inflorescences partially compensate for the decrease on the lowest ones which normally carry most of the pods. The more uniform distribution of pods thus produced may be a useful indication of inadequate pollination in commercial crops.

4435 Ioniță, M.
Rezultate experimentale privind producția de păstăi verzi la soiurile de fasole de grădina. **(Experimental results on the production of green pods by varieties of garden French bean).**
Grădina Via Livada 1959 : **8** : No. 5 : p. 18. (Abst.).

Varieties most suitable for the Rumanian woody steppe were ascertained in trials carried out in 1954–57.

4436 Ramírez, O. D. & Abrams, R.
**An evaluation of five pole-bean varieties for a breeding program.**
J. Agric. Univ. PR 1960 : **44** : 31–34.

Blue Lake 231, Florigreen, Kentucky 191, Blue Lake 92 and Blue Lake 228 were tested in Puerto Rico. The first two varieties are considered to be best suited for use in breeding in that country by virtue of their productivity, good quality and other desirable features.

4437 **New Great Northern bean.**
Agric. Res., Wash. 1960 : **8** : No. 10 :p. 15.

Zaumeyer, W. J., Thomas, H. R. & Afanasiev, M. M.
**A new disease-resistant Great Northern bean.**
Seed World 1960 : **86** : No. 7 : 14, 16.

Great Northern 1140, an early-maturing and high-yielding variety for dry-bean production, is resistant to common bean mosaic and the New York 15 strain of this virus, as well as to several races of bean rust. Because of its early maturity, it may be used to replant damaged crops, while its growth habit may reduce white-mould infection.

4438 Kyle, J. H.
**Factors influencing water entry through the micropyle in *Phaseolus vulgaris* L. and their significance in inheritance studies of hard seeds.**
Diss. Abstr. 1959 : **20** : LC Card Mic 59–3155 : p. 840. (Abst.).

A beeswax-paraffin mixture was used to seal

the micropyle, hilum and raphe of the testa of Great Northern (white seeded) and Red Mexican (red seeded), each area being sealed separately and in various combinations. Five micropyle-size classes were established which ranged from no opening (class 1) to the largest (117 x 29 microns). The percentages of beans absorbing water in a specified length of time were recorded. Absorption in Great Northern was directly proportional to micropyle size, whereas in Red Mexican it was independent of micropyle size, the beans being more permeable in the hilum-raphe area. Data from crosses between the two varieties indicated that permeability of the hilum-raphe area and the frequencies of beans in the different micropyle-size classes were associated with testa colour.

4439 Yen, D. E.
**French-bean rust (*Uromyces appendiculatus*) studies on resistance and determination of rust races present in New Zealand.**
NZ J. Agric. Res. 1960 : **3** : 358–63.

Races probably present in New Zealand are 10, 17 and 28, as identified by differential bean lines used in the USA. Possibly another unidentified race, attacking the differential US780, also occurs. In crosses of resistant Westralia with susceptible varieties, heterozygotes showed a delayed but definite infection in field and glasshouse trials. The reaction of homozygotes for susceptibility was similar to that of the susceptible parents. Susceptibility could thus be termed recessive or dominant according to the time of recording symptoms. The usefulness of this reaction of the heterozygotes in breeding is discussed.

4440 Parsons, P. A. & Allard, R. W.
**Seasonal variation in lima bean seed size: an example of genotypic-environmental interaction.**
Heredity 1960 : **14** : 115–23.

In a study of six hybrid populations from the $F_2$ to $F_7$, $F_8$ or $F_9$ in California, using sowing rates employed commercially, seed size (100-seed weight) fluctuated sharply from year to year in each population. These variations occurred despite the apparent stability of environmental conditions over seven years and each population appeared to react uniquely to annual changes. Within each population and each year, particular genotypes, as identified by marker genes for differences in seed-coat colour, tended to behave similarly. Occasional inconsistencies in the reaction patterns between years indicated, however, that interactions did occur within populations between specific genotypes and the environment. In general, specific interactions were of less magnitude than interactions between population genotypes and seasons. Over-all variation in seed size was therefore largely determined by a genetic background differing with population. The sowing rates used resulted in moderate competition between plants within a population. When, however, competition was eliminated by wide spacing, seed size remained constant over several seasons [cf. XXVII, 3577]. Evidence from other populations had suggested that seed size may be a component of fitness. Seasonal fluctuations in seed size, although apparently fortuitous in the populations under consideration, may therefore contribute to genetic variance for fitness.

4441 Schertz, K. F., Jurgelsky, W. (Jun.) & Boyd, W. C.
**Inheritance of anti-$A_1$ hemagglutinating activity in lima beans, *Phaseolus lunatus*.**
Proc. nat. Acad. Sci. USA 1960 : **46** : 529–32.

Inheritance of the agglutinin for human erythrocytes of blood group $A_1$ was investigated by mating crosses between Fordhook 242 with low agglutinating activity and Cowey and L–121 with high activity. $F_1$ and $F_2$ data indicated that agglutinating activity was dependent upon a single locus, with high activity dominant. When the parent with high activity was used as ♀, the $F_2$ ratios were skewed towards high activity. Three possible explanations of the skewness are given: (1) ovule or embryo abortion occurred as a result of an effect of the cytoplasm of the parent with high activity, (2) selective fertilization occurred because of incompatibility associated with the cytoplasm of the high-activity parent, or (3) cytoplasmic inheritance of activity was manifested in at least some of the homozygous recessive progeny. The difference between lines with low and high activity appeared to be merely a disparity in concentration of agglutinin or in concentration of one or more agglutinin inhibitors.

4442 Saunders, A. R.
**Inheritance in the cowpea (*Vigna sinensis* Endb.). 1. Colour of the seed coat.**
S. Afr. J. agric. Sci. 1959 : **2** : 285–306.

Purple colour of the seed was dominant or epistatic over all other colours, while black was

dominant or epistatic over other colours except purple. The main self colours are ascribed to the following genotypes: purple, *PR*; black, *BNMR*, *BnMR*, *BNmR* or *BnmR*; brown *bNMR*; buff, *bNmR*; maroon, *bnMR*; and red, *bnmR*. *R* apparently acts as a gene for basic colour, since its recessive allele results in a white testa. No linkages were detected. The pigment in brown mottling seems to differ from the pigments responsible for the main self colours. Such mottling may be superimposed upon buff, maroon or red. The gene for brown mottling, *V*, is linked with *N*. Fine stippling, giving a grey appearance, and speckling are confined to black pigmentation. Both may be superimposed upon brown mottled, brown, buff, maroon or red. The colour characteristic of Victor is the result of a combination of brown mottling and grey stippling. Genetic analysis of speckling (*S*) is difficult on account of the high degree of variability in this character.

4443 Pavlova, A. M.
**(Importance of the asparagus bean for breeding).**
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1959 : **32** : No. 3 : 228–32. [Russian].

Figures are given showing that *Vigna sesquipedalis* is superior to *Phaseolus vulgaris* in content of sugars, protein and vitamin C. The species is normally self pollinated but will cross with *V. sinensis*, giving an $F_1$ with pods of intermediate size; segregation in the $F_2$ shows long pod to be recessive.

Descriptions are given of a number of cultivars in the collection of *V. sesquipedalis* at the Institute of Plant Industry, some of them belonging to var. *dolichocarpa* and some to var. *mesocarpa*. The forms from China are the most promising as regards yield. The collection contains forms resistant to mosaic virus; all proved susceptible to nematode, though in varying degrees.

4444 Pavel, I. G.
Soiuri bune de soia pentru Moldova.
**(Varieties of soya bean suitable for Moldavia).**
Stud. Cercet. şti., Biol. Şti. agric. Iaşi 1959 : **10** : 149–56.

Trials of introduced varieties during 1956–58 are reported. While the standard Plattergelbe [*sic*] yielded best, it was exceeded in earliness and in content of protein and fat by some of the Herb lines.

4445 Oprişor, N., Dumitrescu, O. & Busuioc, G.
Rezultatele culturilor comparative cu soiuri şi linii de soia din anii 1956–1958.
**(The results of comparative trials of varieties and lines of soya bean in the years 1956-58).**
Probl. Agric., Bucureşti 1959 : **12** : No. 2 : 19–22.

The trials previously referred to [3326] have been continued for another year.

4446 La soya. **(The soya bean).**
Bol. Divulg. Inst. Fomento Algodon., Bogotá 1959 : No. 18–19 : 14–16.

Of eight varieties selected from a collection of 34, Pelícano [Pelican] and Arcadian proved to be the most productive in tests at Bledonia Agricultural Experimental Station, Colombia.

4447 Johnson, H. W.
**Soybean breeding research—progress and problems.**
Soybean Dig. 1959 : **19** : No. 11 : 54–55.

Varieties released in the USA during 1958 and 1959, progress achieved in breeding for resistance to *Phytophthora* rot and nematode, and the problem of the virus disease bud blight are discussed.

4448 Germanov, A. P.
**(An experiment on cultivating soya beans on the Primor'e collective farm).**
Zemledelie (Agriculture) 1959 : **4** : 52–54. [Russian].

Mention is made of some recent soya bean varieties, Habarovsk 4, bred at the Far-Eastern Agricultural Institute, and Saljut 216 [Salute 216] and Amur 284, bred at the Amur Agricultural Research Station. All three are earlier and more productive than the previous standard Amur 41. Habarovsk 4 has the shortest growth period and Saljut 216 the highest oil content; Amur 284 is the most productive of the three.

4449 Novak, A. G.
**(Growing soya bean in the Far East).**
Zemledelie (Agriculture) 1959 : No. 5 : 58–62. [Russian].

Four high-yielding forage varieties, Ussuri 154 and Amur 57, 116 and 272, bred in the Soviet Far East, are described.

4450 **Scott soybean variety to be released in 1959.**
Soybean Dig. 1958 : **18** : No. 12 : p. 23.

Developed at the Southeast Missouri Research Center and recommended for the southeastern

region of the state, Scott is early maturing, superior in yield to Clark, Perry and S–100, resistant to lodging, wild fire and bacterial pustule and satisfactory as regards oil content.

4451 **Soybean varieties.**
Soybean Dig. 1960 : **20** : No. 4 : 6–8, 10.

**Best adapted varieties map.**
Ibid. 1960 : **20** : No. 4 : p. 9.

**Leading soybean varieties.**
Ibid. 1960 : **20** : No. 4 : 11–12.
Information is given on the agronomic characters and regions of adaptation of varieties in the USA.

4452 Demaree, K. D.
**The effect of variety on quality of frozen green soybeans.**
Soybean Dig. 1959 : **19** : No. 10 : p. 16.
A report is given on an evaluation of named varieties grown in the USA which were analysed with respect to colour, oil content and other factors affecting suitability for freezing as shelled green soya beans.

4453 Fukui, J. & Ota, H.
**(Studies on the suitability of soyabean varieties to deep-ditch culture).**
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1959 : **27** : 446–47. [Japanese].
A parallel series of field and laboratory experiments showed that the varieties yielding best by the above method of cultivation were those least adversely affected by nutrient deficiencies, especially phosphorus shortage.

4454 Smith, P. E.
**New soybean varieties for Ohio.**
Ohio Fm. Home Res. 1960 : **45** : p. 23.
Developed at the Ohio Agricultural Experimental Station, Henry [Richland x (Illini x Dunfield)] and two derivatives of Monroe x Lincoln named Madison and Ross are resistant to *Phytophthora* root rot. Respectively, they belong to the same maturity classes as Harosoy, Hawkeye and Lincoln.

4455 Nonnecke, I. L.
**The precision of field experiments with vegetable crops as influenced by plot and block size and shape. II. Canning peas.**
Canad. J. Pl. Sci. 1960 : **40** : 396–404.
The results described in the second paper in this series [cf. 958] have been briefly reported elsewhere [cf. XXIX, 4528].

4456 Hvostova, V. V. & Nevzgodina, L. V.
**(The frequency of chromosome aberrations in the tissues of pea plants sensitive and resistant to radiation).**
Citologija (Cytology) 1959 : **1** : 403–07. [Russian].
The frequency of chromosome aberrations induced by $\gamma$ rays in *Pisum arvense* and the cultivars Moscow 572 and Capital was studied in the root tips at mitosis. It was found that most aberrations occurred in Moscow 572, fewer being observed in Capital and fewer still in *P. arvense*. Cytochemical analyses of peas differing in respect of vulnerability of the chromosomes showed that *P. arvense* has the highest and Moscow 572 the lowest heteroauxin content in the root meristems.

4457 Pavel, I. G.
Soiuri de mazăre cultivate pentru producția de boabe bune pentru nord-estul Moldovei. **(Varieties of pea grown for the seeds suitable for north-eastern Moldavia).**
Stud. Cercet. ști., Biol. Și. agric. Iași 1959 : **10** : 331–37.
Trials of Rumanian and introduced varieties in 1955–58 are reported. Information is given on morphological and agronomic characters, yield and chemical composition of the seeds.

4458 Lamprecht, H.
Über unvollständige Dominanz des Gens *K* von *Pisum*. **(On incomplete dominance of the gene *K* of *Pisum*).**
Agri hort. genet., Landskrona 1960 : **18** : 57–61.
The gene *k*, whose phenotypic expression is the development of keel-like wings, is normally completely recessive to *K*; occasionally, however, intermediate types are found. One cross with a normal $F_1$ gave an $F_2$ with 26% intermediates, and $F_3$ data indicated that the intermediates were the result of incomplete dominance of *K* in the presence of certain other, unidentified, genes. The intermediate condition was not dependent upon heterozygosity of *K*.

4459 Lamprecht, H.
Weitere Studien zur Genenkarte von Chromosom V von *Pisum*. **(Further studies on the gene map of chromosome V of *Pisum*).**
Agri hort. genet., Landskrona 1960 : **18** : 23–56.
Nine genes in chromosome V were mapped in a

previous paper [XXVII, 4615]. In this paper, three further genes are added, viz. *teu*, which results in narrow pods, and *com* and *sul* [cf. 4463]. Crossing-over values obtained from 12 new crosses are listed for all 12 loci, the probable order of the genes being as given previously [cf. 4463]. Some of the crossing-over values appear to be the result of multiple crossing-over, and there was evidence of a structural chromosome change in two crosses, one having the gene sequence *Gp–Teu–Cp* and the other *Cp–Teu–Gp*.

4460 LAMPRECHT, H.
Zur Wirkung und Koppelung des Gens *Ca*, ein neues Gen für Teilfarbigkeit sowie weitere Koppelungsergebnisse bei *Pisum*. **(On the effects and linkage of the gene *Ca* and a new gene for partial coloration, together with further linkage data in *Pisum*).**
Agri hort. genet., Landskrona 1960 : **18** : 74–85.

Data from two crosses show that the drab-grey seed-coat colour conditioned by the dominant gene *Ca* [cf. XXVIII, 3524] is only expressed in seeds carrying *A*, *z*, *mp* and *cal* for partial coloration of the testa; dominance of *Cal* inhibits *Ca*. *Ca* lies on chromosome III in the neighbourhood of *B*. A new gene, which, like *cal*, governs the partially coloured type *calvitium*, has been designated *cat*, the segregation ratios in one cross being 9 *deminutio* (*Cal Cat*): 7 *calvitium* (*Cal cat* + *cal Cat* + *cal cat*). The character *fasciata*, occurring in the double recessive *fa fas*, was closely linked with three flowers per inflorescence, a character determined by recessiveness in the two genes *fn* and *fna*. Since *fa* lies on chromosome IV and *fn* on chromosome II, at least one of the polymeric genes *Fna* and *Fas* is thought to have undergone segregation, but the linkage relationships of these two genes are not known.

4461 LAMPRECHT, H.
Zur Manifestation und Koppelung der Gene *Pal* und *Str* von *Pisum*. **(On the expression and linkage of the genes *Pal* and *Str* in *Pisum*).**
Agri hort. genet., Landskrona 1960 : **18** : 86–96.

Data from two crosses indicate that *pal*, which lightens testa colour [cf. XXVI, 3940], and the new gene *str*, which governs the appearance of a caruncular stripe in partially coloured seeds carrying *A*, *z*, and *mp*, both lie on chromosome II in the neighbourhood of *Fn*. In one of the crosses studied, a significant correlation between the segregation into fertile and sterile plants and the segregation of genes in chromosomes I and III was found, suggesting that one of the parent lines carries an interchange involving these two chromosomes.

4462 LAMPRECHT, H.
Zur Wirkung und Koppelung des Gens *Fom* für die Blattform von *Pisum*. **(On the effect and linkage of the gene *Fom* governing leaf shape in *Pisum*).**
Agri hort. genet., Landskrona 1960 : **18** : 62–73.

After a survey of nine known genes each with a pleiotropic effect upon the length/breadth ratio of leaflets, stipules and sepals, the linkage relationships of a further gene, *Fom*, are described. The recessive and dominant homozygotes have respectively a high and a normal ratio and the heterozygotes an intermediate one. The locus lies on chromosome I between *Pur* and *Lac*. Further data from the cross in which *Fom* was studied gave the gene sequence *M–F–St–B* for chromosome III.

4463 LAMPRECHT, H.
Zur Vererbung der Samenform bei *Pisum* sowie über zwei neue, diese beeinflussende Gene. **(On the inheritance of seed shape in *Pisum* and two new genes influencing seed shape).**
Agri hort. genet., Landskrona 1960 : **18** : 1–22.

The pleiotropic and linkage relationships of genes known to determine wrinkled, dented, *foveatus* [cf. XXIX, 4662] and dimpled seeds are surveyed. The genetics of the characters *longo-rotundatus*, *oblongus* and *fastigatus* is not yet known with certainty. In a recent cross the characters *planatus* and *quadratus* each proved to be monogenically controlled, with *qua* hypostatic to *Pla*, *pla Qua* seeds being slightly compressed, *pla qua* seeds so strongly compressed as to be almost cubic and *Pla qua* and *Pla Qua* seeds normal. *Pla* lies in chromosome III, probably between *St* and *Fov*. The genes *com* (*comprimere*) and *sul* (*sulcatus*) have been studied in a further cross. In the first, the funicles are 4·99 mm. apart instead of 5·27 mm., so that the seeds become compressed, while in the presence of the second, which is incompletely recessive, the radicle lies in a furrow-like depression. Both *com* and *sul* lie in chromosome V, the probable gene sequence being *Cp – Teu – Gp – Te – Com – Cr – Sul – Cri – Cal – Ce – Fs – U*.

4464 Blixt, S., Ehrenberg, L. & Gelin, O.
**Quantitative studies of induced mutations in peas. III. Mutagenic effect of ethyleneimine.**
Agri hort. genet., Landskrona 1960 : **18** : 109–23.

Seeds of Weitor were soaked in ethyleneimine (EI) for 8 hr. at concentrations of 0·0019 to 0·06% and for 6 hr. at 0·03%. Solution uptake was estimated visually from the appearance of the soaked seeds, giving three classes referred to as none, some and full. The degree of leaf spotting occurring in the seedlings was also assessed. With increasing EI doses the following effects were observed: (1) germination percentage decreased; (2) leaf spotting increased; (3) germination was delayed, except at the lowest dose, which had a stimulating effect; (4) seedling growth in height was inhibited, except at the lower concentrations; (5) survival to maturity was reduced; and (6) number of branches per plant, number of seeds per plant and number of seeds per branch increased. Effects (1), (2) and (5), and also an increase in mutation rate, which was not linearly dependent upon dose, occurred only or most strongly in "full" seeds, and (3), (4), (5), (6) and also increase in mutation rate were most marked in the plants with the most severely spotted leaves. The probability of obtaining mutations may thus be increased by selecting "full" seeds or spotted seedlings. Among the 120 mutants detected, 70% involved chlorophyll disturbances and included three *albina* types, a rare mutation in pea and other legumes.

4465 Daskalov, H., Popova, D. & Mihov, A.
**(New German garden pea varieties).**
Selskostopan. Misăl 1959 : No. 4 : 307–11. [Bulgarian].

Bulgarian trials, including quality testing, of six cultivars introduced from Quedlinburg are reported and descriptions of these varieties are given.

4466 Văzvăzov, I. & Atanasov, S.
**(The results of experiments with forage peas).**
Selskostopan. Misăl 1959 : **4** : 376–79. [Bulgarian].

A report on testing many varieties at the Kolarov Institute in Plovdiv is presented and a spring pea variety 130 which yielded 25·2–40% more seed than others and 12·2–37·9% more hay is described. It originates from Yugoslavia and belongs to the botanical variety *arvense* of *Pisum elatius*. Its valuable characteristics include high dry-matter and protein contents, and tolerance of low temperatures and waterlogging. The variety is uniform as to habit but variable in shape and colour of the seed. It is regarded as useful breeding material.

4467 L'vova, P. F. & Poleščuk, Ju. M.
**(High yields of peas in the province of Voronež).**
Zemledelie (Agriculture) 1959 : **4** : 55–57. [Russian].

Several high-yielding varieties originating from the Ramon' Research Station and the Dokučaev Agricultural Institute are listed. The new variety Dokučaev is drought resistant and outyields the standard variety Ramon' 77.

4468 Hagedorn, D. J.
**Two new disease resistant canning peas.**
Bull. Wis. agric. Exp. Sta. 1959 : No. 539 : Pp. 9.

Further information is provided on New Season (Loyalty x Delwiche Commando) and New Wales (sister selection of Delwiche Commando x Perfected Wales), both resistant to races 1 and 2 of *Fusarium oxysporum* f. *pisi* and to bean virus 2 [XXVIII, 3958].

4469 Atabekowa, A. J.
Cytologische Untersuchungen an der Kulturerbse *Pisum sativum*. **(Cytological studies on the cultivated pea *P. sativum*).**
Biol. Zbl. 1959 : **78** : 424–38.

The processes of microsporogenesis, microgametogenesis and macrosporogenesis are described and illustrated. Pollen is normally binucleate but occasionally trinucleate; it matures before the flower opens, so that cross pollination does not readily occur. Each ovule usually has only one embryo-sac mother cell, but sometimes two or three are found, in which case macrosporogenesis is retarded.

4470 Buxton, E. W., Doling, D. A. & Reynolds, J. D.
**Additional pea varieties and new selections resistant to *Fusarium* wilt.**
Plant Path. 1960 : **9** : 54–56.

In further experiments during 1959 [cf. XXIX, 4665], an additional 35 varieties were tested for reaction to *F. oxysporum* f. *pisi* at two centres in England. Twenty-three were resistant. Of the 53 healthy plants selected in 1958 from 22 susceptible varieties, 49% gave rise to resistant

progeny, all but three varieties remaining true to type. These selections may quickly provide a source of resistant stocks of important varieties.

4471 Tuveson, R. W. & Garber, E. D.
**Genetics of phytopathogenic fungi. I. Virulence of biochemical mutants of *Fusarium oxysporum* f. *pisi*.**
Bot. Gaz. 1959 : **121** : 69–74.

One culture of race 1 was virulent on all five pea varieties tested, while another was virulent on two. Two cultures of race 2 were both virulent on the two varieties on which they were tested. Of 18 ultraviolet-induced biochemical mutants of the first culture of race 1, only that requiring biotin was virulent on all varieties, while those requiring methionine and pantothenic acid were avirulent on all varieties; those requiring lysine, tryptophane or inositol were avirulent, or probably so, on all varieties. The addition of stem and root sections of the host plants to the minimal medium allowed virulent mutants to grow, those mutants which did not grow being avirulent. Of 13 mutants of one of the race 2 cultures, those requiring glutamic acid, proline or biotin were virulent on both varieties, while most of the remainder were avirulent or of doubtful virulence on both. The results are interpreted on the basis of the nutrition-inhibition hypothesis.

4472 Tuveson, R. W. & Garber, E. D.
**Genetics of phytopathogenic fungi. II. The parasexual cycle in *Fusarium oxysporum* f. *pisi*.**
Bot. Gaz. 1959 : **121** : 74–80.

Five heterocaryons and four diploid strains were developed from combinations of pairs of diauxotrophic strains, i.e. strains each having two independent nutritional deficiencies. Both the heterocaryons and the diploids differed in morphology from each other and from their component strains. Three of the heterocaryons yielded conidia carrying nuclei of only one of the constituent strains, one gave some conidia with nuclei of only one strain and others which proved to be recombinant, and the remaining heterocaryon yielded conidia of which a majority appeared to be diploid. Conidia from diploids gave prototrophs and haploid forms with nuclei either identical with, or having one of the nutritional requirements of, nuclei of the spores of the parental heterocaryons; recombinants were obtained from three of the four diploids. Failure to recover all possible recombinants from diploids is attributed to selective effects.

4473 Nolte, H.-W.
Untersuchungen zur Bekämpfung des Erbsenwicklers (*Laspeyresia nigricana* Steph.). [**Investigations on control of the pea moth (*L. nigricana* Steph.)**].
Albrecht-Thaer-Arch. 1959 : **3** : 146–57.

Experiments have shown that short varieties with an early and brief flowering period suffer least from attacks by *L. nigricana*.

4474 Patil, J. A.
**Inheritance study in gram (*Cicer arietinum* L.).**
Poona agric. Coll. Mag. 1959 : **50** : 176–79.

The inheritance of the spreading habit of the *C. arietinum* mutant reported by Chavan [cf. XXII, 1561] was determined by crossing with the normal (erect) varieties Niphad 10, Niphad 30 and Niphad 31. The character was found to be controlled by a single recessive gene.

4475 Pathak, G. N. & Jaimangal Sahai
**K-5, a new green gram for table purpose.**
Indian Fmg. 1960 : **10** : p. 31.

*Cicer arietinum* 'K–5' has been developed in Uttar Pradesh from a cross between a green-seeded strain from Madhya Pradesh and K–4, a white, bold-seeded Kabuli type.

4476 Investigaciones en lentejas. (**Investigations in lentils**).
Agricultura y Ganadería, Santiago de Chile 1959 : **5** : No. 22 : 5–6.

In Chilean tests for resistance to *Uromyces*, the introduced varieties Algérie 211, Larisa 01 and PI209858 were the most resistant, followed by the Chilean varieties LP54–1160, LP54–101 and LP54–117. The resistant material is being multiplied for distribution and use in breeding.

4477 Ramirez, D. A.
**Cytology of Philippines plants V. *Psophocarpus tetragonolobus* (Linn.) DC.**
Philipp. Agric. 1960 : **43** : p. 533.

A chromosome number of $n = 13$ is reported for *Ps. tetragonolobus*.

4478 Daniel, L. & Váróczy, E.
Untersuchung über die Kombinationseignung von Zuckermais bei dialleler Kreuzung. (**Investigations on the combining ability of sweet corn in diallel crossing**).
Z. Pflanzenz. 1959 : **42** : 223–41.

Diallel crosses were carried out with 10 lines

which had been self pollinated for six or seven generations. Variation in general combining ability was found to be statistically significant in 13 characters, including morphological characters and time of silking. It is said that after 50% selection in both directions, variability in general combining ability was reduced for most characters. Correlation coefficients between general combining ability for different characters were determined; no significant correlation was found between row number, length of the first ear and time of silking.
Variation in specific combining ability was also significant for most characters; with respect to ear characters, the significance was greater than for general combining ability.
Determinations of the heritability component of these characters were carried out by Griffin's method; the values varied between 0·32 and 0·92. After selection the variation in heritability was increased, values between 0·00 and 0·95 being obtained. Some of the lines investigated are well balanced and suitable for the production of hybrids; several have good combining ability for yield, the yield of a third of the crosses being superior to that of local varieties by about 40%. The greatest difference in maturity date was only one week, so in future breeding the inclusion of some early and late varieties will be necessary.

4479 Thomas, W. I., Dicke, F. F. & Eldredge, J. C.
**Resistance in popcorn to European corn borer leaf feeding.**
Agron. J. 1960 : **52** : p. 299.
Investigations at the Iowa Agricultural Experiment Station indicated the occurrence of wide differences among inbreds or hybrids in resistance to *Pyrausta nubilalis*. From limited data on all possible single crosses between six inbreds, it appeared that the resistance of a hybrid and the mean resistance of the parental inbreds are associated.

4480 Bose, R. B. & Choudhury, J. K.
**Colchicine-induced polyploidy in *Ocimum kilimandscharicum* Guerke.**
Cellule 1959 : **60** : 135–49.
Colchicine-induced polyploids were taller than diploids, produced almost twice as many leaves but had fewer seeds and a lower germination percentage. Multivalents, rings and irregular chromosome numbers ranging from $n = 10$ to $n = 76$ were observed in pollen mother cells, and the pollen grains were also variable in size with 40–60% sterility compared with 6–16% in the diploids. Since leaf production, content of total volatile compounds and camphor, and total yield of camphor were greater in the induced plants, it is thought that polyploids may prove to be of economic value.

4481 Lutkov, A. N.
**(Experimentally obtained allopolyploid form of peppermint, *Mentha piperita*).**
Sovet. Kuban' (Soviet Kuban') 1957 : 112–15 : from Ref. Ž. (Ref. J.) : 1958 : No. 22 : Abst. 98948 : p. 32. [Russian].
The results of breeding polyploid forms of peppermint having greater economic value than the diploid forms are reported. They comprise forms with 144 and 180 chromosomes. The latter has been introduced on farms under the varietal name Priluki 6.

4482 Abdul Rehman Choudhry
**Some breeding studies in fennel and coriander.**
Agriculture, Pakistan 1959 : **10** : No. 4 : 477–86.
*Foeniculum vulgare* and *Coriandrum sativum* were (1) open-pollinated, (2) artificially cross-pollinated, (3) naturally selfed and (4) artificially selfed, the four methods being applied to different branches of each plant. For fennel, the seed-set percentages were respectively 70·3, 83·3, 27·54 and 38·24, and for coriander 79·6, 85·5, 36·1 and 50·5. The differences between (1) and (2) and between (3) and (4) were significant for each crop, with the exception of the first comparison in coriander. Muslin bags were more satisfactory than butter-paper envelopes.

## ECONOMIC LOWER PLANTS

4483 Gossling, B. S.
**Heritable changes in lactic streptococci induced by physical treatments.**
Nature, Lond. 1960 : **186** : 868–70.
The heritable changes of resistance to lysis by bacteriophage and modifications in lactic-acid production were induced in the entire surviving population by subjecting the streptococci to strong pulses of ionic current, near-lethal temperature and other physical treatments.

4484 Dubinin, N. P. & Šavel'zon, R. A.
**(Mutations and survival of different strains of streptomycin producers under the influence of streptomycin).**
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1960 : **130** : 640–42. [Russian].
The frequencies of different induced mutants

of a streptomycin-producing strain of *Streptomyces griseus* were negatively correlated with their capacity for producing streptomycin; the degree of survival of the spores of the mutants was positively correlated with their capacity for producing streptomycin.

4485 Rautenštejn, Ja. I.
**(The variability of actinophages).**
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) : Ser. Biol. 1959 : No. 5 : 687–97. [Russian].

Cultivating actinophages on *Actinomyces* (*Streptomyces*) cultures resistant to a particular phage but genetically closely related to those susceptible to it gave rise to variants capable of lysing these cultures. The cultures used for the production of phages with altered properties induced diverse changes in the phage, including changes in virulence and the spectrum of lysogenic activity. It is thought that by using a culture whose effects upon the properties of the phage are known *a priori*, phages with desired characteristics can be produced for later use in the selection of phage-resistant cultures.

4486 Kilbey, B. J.
**'Sage': a colour modifier in *Aspergillus nidulans*.**
Nature, Lond. 1960 : **186** : 906–07.

In addition to loci *Y* and *W* for spore colour, reported by Pontecorvo, a third (*SA*) has been detected. The mutant allele *sa* (sage) modifies both the green (*Y*) and yellow (*y*) pigments, giving in the presence of *W* for spore colour, pale green (*sa Y*) and pale yellow (*sa y*) spores. *SA* is independent of *Y* and *BI* (biotin independence) and linked with *W*. Comparison of absorption curves of purified pigment from normal yellow and pale yellow spores revealed that *sa* caused a qualitative change.

4487 Käfer, E.
**High frequency of spontaneous and induced somatic segregation in *Aspergillus nidulans*.**
Nature, Lond. 1960 : **186** : 619–20.

Hyperhaploids, representing 10–20% of the total number of unstable aneuploid segregates derived from a diploid heterozygous for 19 markers on seven out of eight chromosome pairs, produced only haploid sectors. All other aneuploids produced diploid sectors, a high proportion of which were of the parental genotype. Such aneuploids were therefore assumed to be hyperdiploids. Besides the parental diploid sectors, diploid sectors with the "nondisjunctional" type of segregation were found in all cases. The minimum number of extra chromosomes in the hyperdiploids could be deduced from the number of different nondisjunctional types among the diploid sectors. Most hyperdiploids appeared to be of the $2n + 1$ or $2n + 2$ type. Some hyperdiploids also produced large haploid sectors, with a much higher frequency than the parental diploid. The results thus supported the hypothesis that irregular segregation of whole chromosomes may be responsible for the production of all unstable and presumably aneuploid types, as well as of their stable haploid or diploid sectors. Preliminary data on the effects of high doses of X rays on mitotic segregation in another heterozygous diploid have also favoured this view. It is mentioned that two new diploids have been developed with markers on practically all chromosomes of the eight pairs, mostly in repulsion in one diploid and mostly in coupling in the other. It is hoped that they will provide conclusive evidence as to whether haploids are the result of one or several types of mitotic segregation in diploid fungus strains.

4488 Kasatkina, I. D.
**(Biochemical mutants of *Aspergillus nidulans* obtained after irradiation with ultraviolet rays).**
Mikrobiologija (Microbiology), Moskva 1959 : **28** : 807–13. [Russian].

The ultraviolet-induced mutants comprised morphological variants which had lost the ability to reduce nitrates or synthesize tryptophane, methionine, arginine or lysine.

4489 Sun, H.-Ju. [Sung, H.-Y.]
**(The phosphorus metabolism of the T-1 variant of *Aspergillus niger* obtained by ultraviolet irradiation).**
Mikrobiologija (Microbiology), Moskva 1960 : **29** : 8–13. [Russian].

The above mutant differs from the initial strain by a reduced growth rate, increased rate of synthesizing acids and higher sucrose consumption per unit weight of mycelium. The mycelium of the mutant strain has higher contents of phosphorus, nitrogen and ash, particularly at early stages of development.

4490 Wilkie, D. & Plomley, N. J. B.
**Observations on mutants of *Aspergillus nidulans* induced by monochromatic ultra-violet light.**
Heredity 1960 : **14** : 224–25. (Abst.).

The efficiency of the induction of mutations by

irradiating conidiospores in an Uvispek monochromator corresponded to the absorption curve of protein rather than nucleic acid, the mutations scored being (1) lethals,(2) abnormal growth patterns, (3) conidial colour changes and (4) altered biochemical requirements.

4491 Kuzjurina, L. A.
**(Producing mutants in moulds by means of ultraviolet rays. Morphological characteristics of *Aspergillus nidulans* variants obtained by different doses of ultraviolet rays).**
Mikrobiologija (Microbiology), Moskva 1959 : **28** : 667–74. [Russian].

The number of mutants rose as the dose of irradiation was increased from $8 \times 10^{-3}$ to $48 \times 10^{-3}$ erg per conidium. With a further increase in the dose up to $96 \times 10^{-3}$ erg, the number of mutants decreased. Morphological descriptions of the principal mutant forms, including one forming no conidia upon Czapek sucrose medium and another which did not grow upon a medium containing nitrates, are given.

4492 Mishra, A. K. & Nandi, P.
**Ultraviolet induced biochemical mutations in *Aspergillus niger*.**
Sci. & Cult. 1959 : **25** : 81–83.

Mutants requiring vitamins, aminoacids or nucleic acids were induced at the Department of Microbiology, Bose Institute, Calcutta.

4493 Şeptilici, G.
Suşe de drojdii pentru prepararea vinurilor pe regiuni în R.P.R. **(Yeast cultures for the preparation of wines for the various regions of the Rumanian People's Republic).**
Grădina Via Livada 1959 : **8** : No. 5 : p. 36. (Abst.).

A generalized description is given of the Rumanian programme for breeding yeasts suitable for preparing diverse types of wine.

4494 Takahashi, T. & Ikeda, Y.
**Genetic analysis of α-methyl-glucoside fermentation in *Saccharomyces*.**
Z. VererbLehre 1959 : **90** : 66–73.

Irregular segregation with respect to the fermentation of α-methyl glucoside was shown by a cross between a haploid Carbondale strain which rapidly ferments this sugar and a haploid nonfermenter. The results are explained by assuming that there are three genes controlling the fermentation, $MG_1$, $MG_2$ and $MG_3$, the gene $MG_2$ being most effective. The combination of $MG_1$ and $MG_3$ showed no increase in sugar fermentation over $MG_3$ alone but combinations of $MG_1$ and $MG_2$ or $MG_2$ and $MG_3$ were very effective, indicating that both $MG_1$ and $MG_3$ activate $MG_2$. Haploid cultures with various genotypes were recovered showing a range of fermentative activity. The *MG* genes do not appear to have any connexion with maltose and sucrose fermentation.

4495 James, A. P.
**The spectrum of severity of mutant effects. I. Haploid effects in yeast.**
Genetics 1959 : **44** : 1309–24.

"The spectrum of X-ray-induced mutations, as they affect the quantitative character growth rate in haploid yeast was studied. Mutations with effects ranging from lethality to an estimated 18 percent increase in rate of growth were detected. The smallest detected effect was estimated at 3·5 percent. The distribution of induced mutant effects was bimodal, with a peak at the lethal and a second peak at the normal end. The ratio of induced nonlethal to lethal mutations was in excess of **3 : 1**. The distribution of effects was massively skewed toward the normal end. No evidence of X-ray-induced small-effect positive mutation was found, although mutations of large positive effect were present in both control and irradiated populations." [Author's summary].

4496 Wolf, E. & Reuther, G.
Qualität und Resistenz. II. Das Futter-Wahlvermögen von *Drosophila* in Hinblick auf ökologisch verschiedene Weinhefe-Populationen. **(Quality and resistance. II. The food-selecting ability of *Drosophila* with respect to ecologically distinct wine-yeast populations).**
Biol. Zbl. 1959 : **78** : 813–21.

Yeast populations from six hybrid grape varieties and one pure *Vitis vinifera* variety could be distinguished according to their growth characteristics and aroma when grown on a malt-extract substrate; only the *V. vinifera* yeast and one other had a pleasing aroma. Number of eggs and larval growth on the different yeasts were studied in four *Drosophila* species. *D. melanogaster* and *D. simulans* both preferred the more aromatic yeasts, while *D. busckii* avoided and *D. virilis* preferred the *V. vinifera* yeast.

4497 Subramaniam, M. K.
**The yeast nucleus.**
Proc. Indian Acad. Sci. 1960 : **51** : 66–73.

Referring to reports by different investigators,

the author reconciles observations on living and stained preparations of yeast cells. He concludes that the nucleus is an extravacuolar structure with a nuclear membrane, chromocentres and nucleoli and that the vacuole is a cytoplasmic inclusion.

4498 Yotsuyanagi, Y.
Mise en évidence au microscope électronique des chromosomes de la levure par une coloration spécifique. (**Electron-microscope demonstration of the chromosomes of yeast by means of specific staining**).
CR Acad. Sci., Paris 1960 : **250** : 1522–24.
Bodies which resembled chromosomes except that they were less opaque than the cytoplasm were seen in nuclei of *Saccharomyces cerevisiae* in ultrafine sections fixed in permanganate. Root-tip chromosomes of *Allium cepa* appeared similar when treated in the same way, and since subsequent treatment with ribonuclease and uranyl acetate increased the relative opacity both of the chromosomes in the onion and of the nuclear bodies in the yeast, it is concluded that the latter bodies are also chromosomes.

4499 Ganesan, A. T.
**The cytology of *Saccharomyces*.**
CR Lab. Carlsberg 1959 : **31** : 149–74.
Study of a hybrid involving *S. italicus* and *S. carlsbergensis* in its origin and of another derived from a cross between *S. chevalieri* and a red mutant of *S. cerevisiae* indicated that the nucleus undergoes mitotic and meiotic divisions essentially similar to those in higher organisms. Mitosis shows some modifications which have presumably evolved in relation to the budding type of cytocinesis. Centrosomes take an active part in the separation of daughter nuclei. The correct identification of the nuclear sites by means of the Giesma staining technique employed was confirmed by histochemical tests.

4500 Hashimoto, T., Gerhardt, P., Conti, S. F. & Naylor, H. B.
**Studies on the fine structure of microorganisms. V. Morphogenesis of nuclear and membrane structures during ascospore formation in yeast.**
J. biophys. biochem. Cyt. 1960 : **7** : 305–10.
Although the mode of the first reduction division could not be clearly determined in electron micrographs of *Saccharomyces cerevisiae*, the second nuclear division appeared to proceed in a manner similar to that previously observed during vegetative division, i.e. division by constriction without dissolution of the nuclear membrane and without involving discrete chromosomes. Structures could be discerned within the nucleus which were characterized by an electron density lower than that of the rest of the nucleoplasm. The significance of this nuclear differentiation and its possible similarity to nuclear structures reported in other microorganisms are discussed.

4501 Santa María, J.
Poliploidia en Saccharomyces. (**Polyploidy in *Saccharomyces***).
An. Inst. nac. Invest. agron., Madr. 1959 : **8** : 679–712.
A short account of this work has already been abstracted [XXVIII, 4922].

4502 Santa María, J.
Sobre la existencia en *Saccharomyces* de ascosporas de distinto grado de ploidia. (**On the occurrence of ascospores with different levels of ploidy in *Saccharomyces***).
An. Inst. nac. Invest. agron., Madr. 1959 : **8** : 761–72.
In races of *S. cerevisiae* with polysporous asci, asci containing outsize spores have been observed. Spores slightly larger than usual have also been seen in *S. italicus*, which does not have more than four spores per ascus. Some asci contained large spores only, some large and small mixed while the majority had small spores only. It is thought that the large ascospores may be diploid and may have arisen through failure of reduction division in a polyploid ascus which would normally give rise to a large number of haploid spores [cf. XXVIII, 4922].

4503 Wickerham, L. J. & Dworschack, R. G.
**Extracellular invertase production by sexually agglutinative mating types of *Saccharomyces kluyveri*.**
Science 1960 : **131** : 985–86.
Unisexual strains of both mating types of *S. kluyveri* produced exceedingly high yields of extracellular invertase, which generally increased with increase in the number of sets of chromosomes. Bisexual strains produced low yields, similar in magnitude to those given by unisexual and bisexual strains of *S. cerevisiae*, *S. carlsbergensis* and *S. diastaticus*.

4504 Santa María, J.
Sobre especies pluriesporuladas del género *Saccharomyces*. II. Pluriesporulación en *Sacch. fragilis, Sacch. fructuum, Sacch. oviformis, Sacch. oxidans, Sacch. oleaginosus* y diversas razas de *Sacch. cerevisiae*. (**On polysporous species of the genus *Saccharomyces* II. Polysporulation in *S. fragilis, S. fructuum, S. oviformis, S. oxidans, S. oleaginosus* and various races of *S. cerevisiae***).
An. Inst. nac. Invest. agron., Madr. 1959 : **8** : 737–50.

The ability to form polysporous asci has been found in ten further yeasts [cf. XXVIII, 4922], comprising the following: five strains of *S. cerevisiae*; one of *S. oviformis*; one of *S. fructuum*; one of *S. oxidans*; one of *S. oleaginosus*; and one of *S. fragilis*. The polysporous character, which is maintained even under prolonged culture, is now known to occur in 16 strains of *S. cerevisiae* and six further species, isolated from a wide variety of substrates. It is concluded that the diagnosis of the genus should be modified.

4505 Seliverstova, L. A.
(**The effect of X rays upon synthesis of p-aminobenzoic acid by cultures of *Saccharomyces cerevisiae* and *Torulopsis utilis***).
Mikrobiologija (Microbiology), Moskva 1959 : **28** : 830–34. [Russian].

The content of p-aminobenzoic acid in the cells of *S. cerevisiae* which had been irradiated with 60–100 Kr. rose by 70%, while the synthesis of this acid by *T. utilis* which had been given the same treatment was more than doubled.

4506 Pugovkin, V. N.
(**Utilizing selected yeasts in the making of fruit wines in the Ukraine**).
Vinodelie Vinogradarstvo SSSR (Winemak. & Vitic. USSR) 1960 : No. 1 : 51–52. [Russian].

Organoleptic and biochemical tests of wines fermented by yeast strains cultured by the Institute of the Alcohol Industry are reported from Har'kov. As a result of these tests, strains Višnevaja 33 [Sour-cherry 33], Černosmorodinovaja 7 [Black-currant 7] and Sidrovaja 101 [Cider 101] are recommended for fermenting sour-cherry, black-currant and red-currant musts respectively.

4507 Teodorescu, S., Septilici, G., Jurubiță, J. & Eberhardt, F.
Comportarea la fermentare a unor suşe de drojdii pentru prepararea vinurilor spumoase în R.P.R. (**The behaviour during fermentation of some yeast cultures for the preparation of sparkling wines in the Rumanian People's Republic**).
Grădina Via Livada 1958 : **7** : No. 12 : 18–20.

[Cf. XXIX, 2099].

4508 Potec, I., Potec, E., Şeptilici, G. & Butănescu, G.
Comportarea unor rase de drojdii pe must omogen. (**The action of some yeast races on a homogeneous must**).
Grădina Via Livada 1959 : **8** : No. 5 : p. 37. (Abst.).

[Cf. 3362].

4509 Šahsuvarjan, A. V.
(**The biochemical activity of sherry yeasts from Uzbekistan**).
Vinodelie Vinogradarstvo SSSR (Winemak. & Vitic. USSR) 1960 : No. 1 : 9–12. [Russian].

Mention is made of new Uzbek strains which are tolerant of 15–16% alcohol; strains 84 and 134 were the most active in synthesizing aldehydes and acetals.

4510 Santa María, J.
Oxidación de alcohol etílico a ácido acético por levaduras vivas. I. *Saccharomyces aceti* nov. spec. y *Saccharomyces oxidans*, nov. spec., nuevas especies aisladas de vino. (**Oxidation of ethyl alcohol to acetic acid by living yeasts. I. *S. aceti* nov. spec. and *S. oxidans* nov. spec., new species isolated from wine**).
An. Inst. nac. Invest. agron., Madr. 1959 : **8** : 713–35.

The above new species are described. The first, isolated from a red wine from Galicia, forms a fine film on the wine, oxidizes the alcohol to acetic acid and is only able to ferment glucose. The second, from white wines from Huelva and Cáceres, also forms a fine film and oxidizes alcohol to acetic acid, but is able to ferment sucrose and one third of the raffinose present as well as glucose.

4511 Santa María, J.
Oxidación de alcohol etílico a ácido acético por levaduras vivas. II. Características de un híbrido entre *Saccharomyces oxidans*, nov. spec. y *Saccharomyces oleaceus*, nov. spec. **(Oxidation of ethyl alcohol to acetic acid by living yeasts. II. Characteristics of a hybrid between *S. oxidans* nov. spec. and *S. oleaceus* nov. spec.).**
An. Inst. nac. Invest. agron., Madr. 1959 : **8** : 751–60.

The above hybrid was intermediate in form between the two parents, resembling *S. oleaceus* in its ability to ferment galactose and melibiose and *S. oxidans* in its ability to ferment sucrose. The capacity of *S. oxidans* to oxidize ethyl alcohol [cf. 4510] was almost completely lost in the hybrid. The characters of the hybrid correspond with those described for *S. microellipsodes*. If a species is defined as including all potentially interbreeding individuals, the descendants of which are also potentially interbreeding, the above results indicate that a taxonomic revision of the genus is desirable.

4512 Santa María, J.
**Taxonomy of yeasts.**
Nature, Lond. 1960 : **185** : 781–82.

With reference to fermentative capacities and other properties, the author describes anomalies which in his view make a complete revision of the present system of classification of yeasts unavoidable.

4513 Mejsel', M. N. & Sokolova, T. S.
**(Inherited cytoplasmic changes induced in yeasts by acriflavine and berberine).**
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1960 : **131** : 436–39. [Russian].

Acriflavine and berberine induced mutations of the petite type in *Saccharomyces carlsbergensis* and acriflavine also induced mutations in *S. ludwigii*, though these were less frequent. The mitochondria of the mutants lost the capacity for intake and accumulation of berberine sulphate and aurophosphine.

4514 Korogodin, V. I. & Aj-šen', L.
**(The laws of the effect of ionizing radiations upon haploid yeasts, *Zygosaccharomyces bailii*).**
Citologija (Cytology) 1959 : **1** : 379–86. [Russian].

The effects produced upon natural haploid yeasts by $\gamma$ rays are similar to those produced upon artificial haploid yeasts; it is thought that recessive lethal mutations are mainly responsible for inactivation of the cells. The view is propounded that the number of chromosome sets determines to a large degree correlations between the local and cumulative effects of radiation injury in yeast cells.

# BOOK REVIEWS

4515 Fisher, R. A.
**The design of experiments.**
Oliver and Boyd, London and Edinburgh 1960 : 7th Ed. : 15s. : Pp. xiv + 248 : 5 figs. : 39 tables.

The sixth edition of this classical and indispensable introduction to the theory of statistical experimentation was published in 1951 [cf. XXI, p. 998]. The present edition incorporates only minor alterations in comparison with its predecessor, and the principal of these concern the basic logic of applied statistics which has been a major preoccupation of the author in recent years. The major additions are section 12.1, in which the author pungently exposes the logical confusion that has enshrouded the nature of acceptance procedures, and section 21.1, in which nonparametric tests are torn down from the pedestal upon which some statisticians have placed them.

4516 Haslett, A. W. & St. John, J. (Editors).
**Science Survey.**
Vista Books, London 1960 : 25s. : Pp. 360 : figs. : plates.

The British Association for the Advancement of Science has cooperated in the production of this survey of recent developments and advances in the scientific world. It is written for "the general reader", who will include specialists in any given field reading the contributions on almost any other. After a foreword by the President of the Association, Sir George Thomson, we plunge at once into an account, by O. R. Frisch, of Fundamental particles, in which we are introduced to mesons and hyperons as well as the more old fashioned particles like protons and neutrons, and to positrons, antiprotons, antineutrons, photons, neutrini (unfortunately anglicized to neutrinos) and even antineutrinos—what does grammar matter at

this level of remoteness? And the graviton, we read, is hardly yet even a matter of speculation, though pions have been shown to occur in the stratosphere; their lifespan is only one forty-millionth of a second, since they break up into neutrinos and muons, which "can go clean through atomic nuclei". In addition to all these, commonplace, particles there are, it seems, sixteen others called the "strange particles" each charged with different amounts of "strangeness", though what "strangeness" is, apparently, nobody knows.

There follow contributions on the origin of stars, electrons in crystals and various topics concerned with industry, one of these being Modifying materials by irradiation, by A. Charlesby, after which we come to a section devoted to cells, viruses and heredity. T. S. Work writes on Cells and their reproduction, tracing the knowledge of cellular structure from Robert Hooke in 1665 to the present day, the fundamental connexion between DNA and protein structure being explained. J. Baddiley, writing on Bacterial cell walls, explains the significance of some of the knowledge acquired recently about the structure and composition of the wall for an understanding of the vital functions of the bacterial cell; certain highly active polymers known to occur only in bacteria, the teichoic acids, are thought to have some metabolic function. In Building viruses, A. Brenner expresses the view that an understanding of how the virus controls the cell and reproduces within it may provide the key to the fundamental properties of living systems. An examination of virus protein suggests that it is not a single giant molecule but an assembly of identical protein subunits and this is illustrated by models and electron micrographs of some typical viruses. For bacteriophage it is suggested that the head may be built like the adenovirus and the tail like tobacco mosaic virus. It seems that for all viruses the structures are formed "because protein and other molecules have a built-in design that enables them to pack with each other in a defined manner". After a chapter on haemoglobin we come to Genetics and "The origin of species", by J. Heslop-Harrison, who considers the "biological species" and the various mechanisms by which they achieve their breeding independence, a problem which Darwin is said to have left unsolved. Evidence is cited to prove that divergence under selection may occur even when there is a considerable amount of gene flow; chromosome aberrations are considered both as a mechanism of immediate speciation and as a means of providing fertility barriers that may lead to speciation.

The following sections deal with radiation and fallout, organisms and their behaviour, the earth, and space exploration.

4517 Begg, C. M. M.
**An introduction to genetics.**
The English Universities Press, Ltd., London 1959 : 35s. : Pp. xi + 292 : 122 figs. : 19 tables.

It is significant of the present trends in biological thinking that the first chapter of this text book on genetics gives, after a description of the cell nucleus and its division, an account of nucleic acids and an explanation of their structure, based of course on the Watson-Crick model. Difficulties inherent in the scheme are referred to but not discussed in detail. Next come chapters devoted to reproduction in plants and animals, meiosis, Mendel's laws, the genetics of sex, linkage, the mechanism of crossing over, spontaneous and induced mutations, gene interaction, population genetics and breeding systems. Attention is called to the potential dangers of radiation, since "many doctors and physicists have had no genetic training, and may therefore be only vaguely aware of the genetic hazards involved."

Some consideration is also given to certain rather less straightforward phenomena such as position effects, phage genetics, cytoplasmic inheritance and biochemical genetics.

In the chapter on evolution the principle of natural selection is explained and the contributions made by genetics to an understanding of its mechanism are explained; the assumptions of the Lysenko school are mentioned but said to be both unnecessary and without factual basis, some defects in the technique on which they are founded being pointed out.

The volume ends with a set of problems for the student, the answers to which are also provided.

4518 Goldschmidt, R. B.
**In and out of the ivory tower.**
University of Washington Press, Seattle 1960 : $5.75 : Pp. xiii + 352 : illus.

Some of the impressions of a rich life, packed with unusual experiences, many of them in an era that has now passed into history, have already been given us in a slender volume published during Goldschmidt's lifetime [XXVI, p. 695]. The autobiography fills in a great number of details and a large part of it consists of a catalogue of his travel impressions. They include descriptions of Japan as seen by

a European visitor in 1914 and of the changes encountered ten years later; the elaborate tea ceremony is described, head hunters and drunken orgies are mentioned side-by-side with the organization of picked graduates from a progressive girls' school to help in the breeding of sixty thousand gypsy moths in a trip to Formosa. We read of giving lectures on biology, playing in a symphony orchestra and studying Spanish and Chinese in an internment camp in the first world war; the "new experience" of an English winter "where even the baby was washed in an ice-cold room and survived". There are poignant descriptions of postwar Vienna and, later, Germany in the grip of inflation and, later, of National Socialism. We read of visits to Peking, the Forbidden City, and to Okinawa when it was still "a lovely island that had been untouched for centuries"; a visit to Korea, at that time a "beautiful country with rolling hills and high mountains inhabited by mild-mannered, good-looking people"; and an anthropological study of a group of inhabitants of the Bonin islands descended from a colony of English whalers and Polynesian women. We learn of the liberal attitude to science in Germany between the wars, where it was possible for the author to handle one hundred thousand experimental animals, and of the multifarious activities entailed. There are interesting personal comments on such people as Kammerer and his notorious work on the inheritance of acquired characters, on his follower, T. D. Lysenko, on Sir J. C. Bose, Erwin Baur, the originators of the race doctrine and many others.

There is a characteristic summing up of the situation concerning the author's concept of the material basis of evolution: "though it is still violently attacked today by the partisans of one very fashionable way of looking at evolution, I am certain that in the end I shall turn out to have been right". Only in an appendix does he attempt an assessment of his scientific work, where modesty is set aside and we are given an outline of the development of his ideas on intersexuality, physiological genetics, evolution and the nature and action of the gene. The volume ends with a classified bibliography of the author's works.

4519 KEMPTHORNE, O. (Editor).
**Biometrical genetics.**
Pergamon Press, London 1960 : 42s. : Pp. viii + 234 : figs. : tables.

A symposium on biometrical genetics was arranged to open the Third International Biometrics Congress at Ottawa and the papers presented on this occasion are brought together in the present volume.

There are three sections, respectively entitled Theoretical genetics, Design of experiments, and Experimental results, but the subject matter is much the same in each. Most of the papers are at an advanced mathematical level.

The opening paper in the first section, Dominance, genotype-environment interaction, and homeostasis, by R. E. Comstock, was stimulated by Lerner's concept of heterozygote homeostasis [cf. XXV, p. 102] and discusses to what extent this phenomenon would be responsible for biases in the estimation of variance components. A very short paper, The balance-sheet of variability, by K. Mather, follows; it outlines the author's views on the partitioning of variance and the estimation of the number of effective factors.

Some problems of very general interest are tackled by O. Kempthorne in the Biometrical relations between relatives and selection theory. While ostensibly examining the extent to which phenotypes can be predicted from the performance of their relatives, this paper includes a valuable discussion on the assumptions underlying current mathematical theories of selection and concludes that the hiatus between the mathematical theory and breeding procedures and results is greater than generally realized. E. C. R. Reeve and J. C. Gower, in their paper on The effects of inbreeding when selection acts against homozygosis at one or more loci, compare the effects of selfing and sib-mating on two linked loci, one directly affected by selection and the other not, the relevant matrices having been analysed by the Rothamsted digital computer.

Two papers describe experiments on using digital computers to simulate genetic populations. The second of these, Simulation of genetic systems by automatic digital computers. 5. Linkage, dominance and epistasis, is by A. S. Fraser, the pioneer of this type of experiment [cf. XXIX, 185], and extends his earlier work to the cases mentioned in the subtitle. The first paper, High speed selection studies, by F. G. Martin and C. C. Cockerham, is similar in scope to Fraser's earlier studies of selection [cf. XXVIII, 1141–2] though the computer programme was based on rather different procedures.

D. S. Robson is one of the few mathematical geneticists to have concerned himself with haploids [cf. XXVIII, 1122]; in his present paper, Genetic and statistical theory for

quantitative inheritance studies of haploids, a detailed analysis of genetic variance components is made for the haploid case.

Mathematical interest seems to predominate in C. F. Mode's paper on A model of a host-pathogen system with particular reference to the rusts of cereals; the author was able to define an equilibrium state in which a mixture of host varieties and pathogen races remained constant; this equilibrium was however unstable.

The remaining paper in the first section, The problems of multifactorial genetics in man, by F. Keiter, reviewed this topic at a comparatively elementary level.

Three papers in the second section manifest the increasing preoccupation of biometrical geneticists with the problem of genetic-environmental interactions. In the first of these, Experimental design on the measurement of heritabilities and genetic correlations, A. Robertson deals with the estimation of heritabilities and with the use of genetic correlations between the same character in different environments to estimate genetic-environmental interactions. In the second, The interpretation of calculated heritability coefficients with regard to gene and environmental effects as well as to genotype-environment interactions, by H. L. Le Roy, somewhat similar problems are treated along different lines, and in the third, the Importance of genotype-environment interactions in random sample poultry tests, A. W. Nordskog and O. Kempthorne assess the importance of these interactions in poultry breeding.

Of the other two papers in this section, the first, An experimental design for separating genetic and environmental changes in animal populations under selection, by K. Goodwin, G. E. Dickerson and W. F. Lamoreux, describes a method involving multiple mating to detect genetic advance. The second paper, The estimation of variance components of certain types of experiment on quantitative genetics, by J. A. Nelder, is of special interest since it examines diallel-cross data involving *Nicotiana rustica* previously analysed by Mather and Vines [cf. XXIV, 7] by the method of unweighted least squares. The author used compound cumulants to obtain weights for the second-order statistics and found evidence of strong heterogeneity between years and between blocks for some of the statistics and also found that the evidence for linkage was inconclusive, in all these conclusions differing from those previously obtained without weighting.

The first paper in the third section, Studies on estimation of dominance variance and effects of linkage bias, by H. F. Robinson, C. C. Cockerham and R. H. Moll, provides evidence for supposing that linkage may bias dominance estimates in maize. The unwillingness of organisms to conform to genetical theory comes up again in a paper by G. A. Martin and A. E. Bell entitled An experimental check on the accuracy of prediction of response during selection. The authors were especially interested in the possibilities of predicting changes in unselected traits during a mouse selection programme but found that genetic correlations were of very little use for this purpose. R. W. Mason, H. H. Nicholson, R. Bogart and H. Krueger also provide a mouse paper, Predominance of hybrid losses or negative heterosis in mouse crosses, in which they report that maternal effects were frequently responsible for negative heterosis. A. F. Purser, in his paper on The use of correction for regression on a second character to increase the efficiency of selection, states that genetic gains 25% over that obtained by direct selection, resulted from applying a correction for correlation in sheep breeding. Finally, C. K. Chai applies path-coefficient analysis to Endocrine variation: Heritability of iodine metabolism in the thyroids of mice.

4520 Zamenhof, S.
**The chemistry of heredity.**
Blackwell Scientific Publications, Oxford 1959 : 34s. : Pp. xi + 106 : 10 figs. : 7 tables.

A simple account of the experiments on transformation and transduction in bacteria introduces the reader of this slender volume to the notion that chemical substances of known composition play a decisive role in heredity, DNA being referred to as "the only substance which enjoys the evidence for carrying the 'main' heredity of the cell". The reader is told of experiments showing the infectivity of viral nucleic acid; the evidence suggesting nucleic acids as the sole carrier of hereditary information in higher organisms, though largely indirect, also points to DNA. The basic points of the chemistry of the nucleic acids are reviewed, differences in the composition of the nucleic acids from different species being referred to. The irregularity of arrangement of purines and pyrimidines in both DNA and RNA is said to be bewildering, but more than sufficient to bring about the specificity required of a heredity determinant; and of course the Watson-Crick model is mentioned, being described as

"one of the most esthetic concepts in modern biochemistry". We are told of the synthesis of DNA *in vitro*, though techniques are not sufficiently refined to detect whether such synthesized DNA contains properly arranged nucleotides or is merely "nonsense DNA". The unit of heredity may, it seems, be no more than a few nucleotides long, in which case there ought to be thousands of such units per molecule of DNA; thus the one gene per molecule idea is felt to be "definitely outmoded".

Certain substances that are necessary for life, including adenine and ascorbic acid, are, it is pointed out, also mutagens. Directed mutations are however "almost as remote as ever". Most cases reported as cytoplasmic inheritance seem to be suspect, and as for metabolic pathways, the cell, we read, "though most economical, also believes in insurance and is prepared to meet all sorts of emergencies"; though the mutation of whole blocks of genes together is thought likely to lead to "a biochemical mess" it has been known to occur and may have evolutionary significance. A final chapter mentions some cases of hereditary metabolic blocks in human beings.

The reader may find the racy colloquial style of the book entertaining. Paying, as he will, at the rate of a shilling for every two pages of text, he may nevertheless feel entitled to expect a higher standard of editorial accuracy.

4521 Collin, R.
**Evolution. Hypotheses and problems.**
Burns & Oates, London 1959 : $2.95 : Pp. 143.

Professor Collin, formerly Director of the Institut d'Histologie at Nancy, concerned himself for many years with the interrelations of biology, metaphysics and religion. The present volume, a translation of a posthumous work, provides a conspectus of his considered views on these matters.

The first five chapters, dealing respectively with cosmogony, the origin of life, biological classification, types and laws of evolution and the origin of man, present a fair if rather elementary account of contemporary scientific views.

In chapters VI to IX, in which inadequacies of the present theory and its underlying metaphysics are examined, several points of interest are made. The author has no time for Lamarckism and fails to elaborate, in this connexion, the significance of recent work on adaptation in microorganisms. His treatment of orthogenesis, on the other hand, is good. Among the inadequacies of contemporary theory he includes the failure to explain the cessation of the formation of new higher taxonomic groups for so large a part of geological time, the difficulty of bridging the gaps between phyla, and the invariance of so many biological characters.

The author is on firm ground in maintaining that all evolutionary theories rest on metaphysical postulates, such as the conformity between intellectual constructs and the real world, which their upholders are often reluctant to admit. His analysis, however, of these metaphysical postulates is somewhat superficial.

One detects superficiality also in the last chapter dealing with evolution and Christianity. Here the author is concerned solely with Catholic theology and in particular with the evolutionary views of Teilhard de Chardin. This, in some ways, confuses the issue since Teilhard de Chardin combined Catholic dogmatic principles with an intoxicating metaphysical panevolutionary theory with strong affinities to the evolutionary humanism of J. Huxley. Neither Teilhard de Chardin nor Huxley can be taken as representing the typical metaphysical outlook of their more sober biological colleagues, whether Catholic or agnostic. Professor Collin obviously regards Teilhard de Chardin's views as hardly compatible with Christian orthodoxy but the alternative that he suggests involves an application of neoscholastic principles too crude for this purpose. Thus the author would maintain, with Aristotle, that organisms display immanent activity tending to the maintenance in existence of the biological organization. What he fails to realize is that immanent activity can also be predicated of nonliving molecular systems, of molecules, of atoms and of subatomic entities.

This book cannot be regarded as resolving the present frictions between biology and Christianity and indeed the author is more intent on surveying the problems than on proposing any slick solution. However it is encouraging to have the problems stated without reference to the first book of Genesis.

4522 Darlington, C. D.
**Darwin's place in history.**
Basil Blackwell, Oxford 1959 : 9s. 6d. : Pp. ix + 101.

In attempting to place the work of Charles Darwin in proper perspective, an outline is given of the contributions to the idea of evolution made by some of his predecessors, starting

with Leonardo da Vinci. Many of the ideas commonly associated with Charles Darwin are shown to have been expressed in the writings of his grandfather, Erasmus Darwin, who also is said to have supplied the basic ideas for the theory of Lamarck and for many of his opponents. One of these was William Lawrence, whose work was denied copyright "on the grounds that the work contradicted the Scriptures". Others, besides Wallace, who developed ideas similar to those of Darwin included Robert Chambers, author of the *Vestiges of the natural history of creation*, and Charles Naudin. Charles Darwin in turn is shown to have taken part of his material, unacknowledged, from the writings of one Edward Blyth and is criticized for failing to distinguish between the theory of descent, which was common to Lamarck and a number of others, and natural selection, which was his own; moreover, he gradually retreated from the selection principle in favour of an increasing assumption of the inheritance of acquired characters, to the embarrassment of many of his followers, and the thorny problem of heredity was gradually and comfortably allowed to fall into the background. The contributions made after Darwin's death to an understanding of heredity by such men as Weismann and Mendel are shown to have been anticipated by the work of Naudin but Darwin's comment upon this—"I cannot think it will hold"—is quoted.

It is conceded that Darwin convinced the world of the historical fact of evolution but, we are told, "by contrast with Wallace, Lyell, Hooker, Chambers or even Spencer, Darwin was slippery". The inherent ambiguity of his theory has, the author suggests, led to the development of the most diverse viewpoints, many of them overtly Lamarckian, under the name and cloak of Darwinism, not only in biology but also in social and political life, and an appeal is made for a return to a more strict application of the selection principle.

4523 Zimmerman, P. A. (Editor).
**Darwin, evolution and creation.**
Concordia Publishing House, St. Louis, Missouri 1959 : $3.95 : Pp. xii + 231 : 2 tables.

The editor of this volume, in the introduction, states "we hold that where Scripture speaks clearly man's reason must bow. For the Bible is God's Word, eternally true and without error in all its parts". In the light of this tenet the theory of evolution is reexamined. In chapter 1, W. H. Rusch discusses Darwinism, science, and the Bible; he cites a large number of scholars who expressed evolutionary viewpoints, starting with Thales of Miletus (640–546 BC) and leading finally to Charles Darwin. Several recent pronouncements of eminent authorities, concerning the efficacy of selection as an agency of evolutionary change, are cited and shown to be mutually contradictory; many of them point to the absence of the expected intermediate forms in the fossil record and the conclusion reached is that "the creationist can find room for microevolution or variation, but refuses to accept macroevolution, on the grounds that it is unscriptural as well as unproved in any form"; and that "with the passing of 100 years since Darwin's *Origin* appeared, evolution has failed to achieve the status of the absolute and factual."

Chapter 2, entitled In the beginning God created, is by R. F. Surburg, who states that "God alone laid the foundations of the earth and set the cornerstone of it (Job 38:6). Therefore the problem of origins cannot be solved by observation or experience"; 25 passages from the Old and New Testaments are cited in support of the doctrine of creation. Alternative interpretations of the account in Gen. 1:1 are said to be "possible grammatically" but "highly improbable". The views of innumerable authorities are given concerning the exact interpretation to be given to the "days" and "species" in the Genesis account of creation; the lack of accord among modern biologists concerning the definition of a species is pointed to; we are assured that the Bible does not say that no new species can arise, the creation having apparently been confined to the larger orders or phyla; however, we are told that a system that "endeavors to accommodate Gen. 2 to evolution attacks the integrity and infallibility of the entire Bible and sets the church adrift upon a sea of doubt and uncertainty as to just what is God's divine revelation and what is merely folklore".

P. A. Zimmermann, in chapter 3, writes on The evidence for creation, and summons views of astronomers, mathematicians and others in support of the principle of design as opposed to chance in the creation of the universe, of the solar system and of life. The odds against the origin of the eye, the antibodies and other vital systems originating by a series of lucky accidents are described as "staggering" and the systems move the author "to praise the wisdom and design of the Great Chemist, the Lord Himself". Optical activity in organic chemicals is seen as an insuperable obstacle against the

evolution of life from inorganic material, though no explanation is offered of the preference of the Creator for optically active molecules.

In chapter 4 The case for evolution is examined by J. W. Klotz, who tells us that "an albino human being and an albino deer probably have not gotten that characteristic from a common ancestor" and finds arguments based on similarity or homology to be unconvincing. The problems posed by the fossil record are found to be embarrassing for both evolutionist and creationist; most of the anthropoid fossils are pronounced to be *Homo sapiens*; reference is made to the Piltdown deception; mutations are considered to be generally harmful; very few geneticists are said to accept Goldschmidt's theory of macromutations; and the case for evolution is found to be "not proved".

In chapter 5, The age of the earth, P. A. Zimmerman concedes that Ussher's estimate of 4004 BC for creation is inaccurate but points to uncertainties attached to radiological methods of dating. We read that "the decay rate of mesons is effected [*sic*] by their velocity", that we are "only beginning to find out what time is" and that the evidence from radiocarbon serves to reduce many previous estimates of the age of the earth; however, to attempt to probe the beginnings "by using modern conditions is to ignore the fact that creation was a once-in-eternity event to which present laws do not apply".

The last chapter, by R. F. Surburg, deals with The influence of Darwinism; religious liberalism and "such erroneous philosophies as positivism, pragmatism, materialism, and socialism" are all named among the baleful consequences of Darwinism, as well as behaviourism, Freudian psychology and many others. The propagation of evolutionary ideas in the American educational system is deprecated on the grounds that it "denies the Biblical teaching concerning man's inborn sinful nature", fails to prepare people for eternity and has fostered infidelity, racialism, wars and political anarchy.

4524 HARPER, J. L. (Editor).
**The biology of weeds. A symposium of the British Ecological Society, Oxford, 2nd-4th April, 1959.**
Blackwell Scientific Publications, Oxford 1959 : 42s. : Pp. xv + 256 : figs. : tables : plates.

As pointed out in the introduction, weeds were for many years regarded as "slightly improper material" for pure botanical studies, but during the past ten or fifteen years they have begun to acquire a new and more respectable status and much work is now being carried out on their taxonomy, evolution, genetics, physiology and ecology. The first three papers are concerned with the development of weed floras. H. Godwin describes the history of the British weed flora traced from analysis of pollen and other plant remains and from correlations with archeological data. A. H. Bunting analyses the development of weed floras in areas new to agriculture where invasion by weeds can be followed at the same time as invasion by farming. H. Lieth examines essentially the same problem on a smaller scale of time and space, in observations on the development of a weed flora in a controlled water-table experiment on a pasture community at Hohenheim, Western Germany. Weedy species present special problems in taxonomy and evolution, since man's activities not only provide new types of habitat but also break down geographical barriers. Referring to British weeds, E. F. Warburg examined some of these problems, including the role of polyploidy in the origin of weedy annuals and perennials. In the three papers immediately following, work on the taxonomy of *Polygonum aviculare, Viola tricolor, Hypericum perforatum* and *Euphorbia cyparissias* is reported. The next four chapters deal with dormancy and dispersal of weed seeds. The manner in which weeds interfere with the growth of crops is a subject of considerable dispute. In the succeeding section, J. L. Harper described the ways in which the numbers of weeds present in an area are regulated both by intraspecific interference and by the influence of the crop. J. K. A. Bleasdale describes an experimental analysis of the relationship between weed infestation and yield of vegetable crops, while in three other papers experimental investigations are reported on the possible role of toxic substances produced by weeds in reducing crop growth. In most of the papers so far mentioned, the weeds concerned have been predominantly annuals, figuring in northern temperate agriculture or horticulture. In the next section, papers on woody, aquatic and parastic weeds have been grouped together under the general title, Special weed problems. In the final section, four contributions are devoted to autoecological studies of particular perennial weeds: *Cirsium arvense, Tussilago farfara, Allium vineale, Plantago* spp. and *Nardus stricta*. The topic of chemical control has been deliberately excluded from the symposium, but in the introduction attention is drawn to opportunities offered to the botanist to follow

the impact of herbicides upon the distribution, frequency, evolution and population dynamics of weeds, since these substances are now so widely used that they are beginning to form part of the normal environment of weed populations.

4525 WILLMER, E. N.
**Cytology and evolution.**
Academic Press, New York and London, 1960 : $10.00 : Pp. x + 430 : figs. : tables.

"The evolution of the organs of the animal body is the basis of much zoological training; but the story of the evolution of the constituent cells and tissues is only beginning to be told." This seems to be the author's text. The behaviour of cells in tissue culture is described in the first chapters and it is emphasized that, regardless of the medium in which they develop, the cells that form in hanging-drop cultures conform to one or two of a very limited number of basic types. Cells of each type may evolve along a number of distinct lines but there is evidence that, by reversing their evolution, they can, to some extent at least, start again on another line. It remains a matter of conjecture how far, if at all, the cells of the different types —mechanocytes, epitheliocytes, amoebocytes— are capable of being transformed one into the other. The properties of the cell surface may, it is suggested, be important in governing the type and behaviour of the cells; differences in the nuclei are also evoked, though in a somewhat vague and unconvincing form: "The embryonic nuclei are capable of differentiating, probably under the influence of changes mediated through the cytoplasm, so that in future, they can produce a particular type of cytoplasmic organization, i.e. the activity of different sets of genes are [*sic*] called out by particular events in the cytoplasm, and once they have been called out, it becomes more difficult to suppress them and to evoke the activity of an alternative set of genes".

Cells of essentially the same basic types are shown to exist in the sponges and other invertebrates, and certain Protozoa are described which may, according to circumstances, exist in either an amoeboid or flagellate condition, with corresponding changes in the character of the cell surface, and can furthermore develop a temporary colonial form. One such organism, *Naegleria*, has been a favourite object of study by the author and is examined in detail, particularly with reference to the factors that favour the conversion of the cell from one type to the other; ionic balance is the factor to which the system is most sensitive; the two types apparently have roughly opposite and complementary requirements, the one conserving cations and the other ejecting them and so on; thus the possibility arises of the establishment of a gradient, not only within a tissue but within an individual cell. Cells from the intermediate regions of such gradients may, it is believed, retain their capacity to differentiate in one or other direction according to circumstances; a number of examples are given of cases in which this is thought to have happened. The rest of the book is taken up with an examination of the various tissues of the higher vertebrates and an attempt to relate them to one or other of the basic cell types. It is suggested for instance that the form of the male or female gamete may depend, as *Naegleria* does, on the concentration of salts or cations in its immediate environment. In an outline of the development of the eye in vertebrates, a subject to which the author has also devoted much study, we are told that the rod of the retina is, in all probability, a modified flagellum, whereas the cones show stronger resemblances to the amoebocytes in their behaviour.

4526 STEWARD, F. C. (Editor).
**Plant physiology. A treatise. Volume 1A. Cellular organization and respiration.**
Academic Press, New York and London 1960 : $13.00 : Pp. xxvii + 331 : figs. : tables.

Coming after volume 2 [cf. 2139], volume 1A is concerned largely with works on cells and cellular respiration, while photosynthesis is reserved for volume 1B. After an historical introduction by F. C. Steward, the first chapter is devoted to the plant cell and its inclusions, by R. Brown, who also treats the subject historically, showing how early critics of the cell theory have recently been vindicated by the finding that protoplasmic connexions (plasmodesmata) do exist between the cells in a tissue, though the amount of intercellular exchange that they permit is shown to be limited; nor has their mode of origin been fully clarified though it has been claimed that they may form between cells of different genetic constitution in chimeras.

Structure and composition of the various constituents of the cell are described in some detail. Some phenomena such as autonomous movement of mitochondria and chloroplasts are

thought to be possibly the result of density changes in the cytoplasm brought about by substances produced by the organelles in question. The structure of the nucleus is said to be such that metabolic components are more readily dispersed from it than from any other of the organelles. In the light of the structures described, the metabolic functions of the cell are considered, and the reader is presented with a picture in which every single structural component is subject to a process of continual degradation and reformation: "in the cyclical process of metabolism chemical components of structural elements, such as the wall, the cytoplasm, and the nucleus, are continually being released and discharged in a soluble form into a metabolic pool". Four phases in this process are considered separately: "(a) degradation of structural components, (b) respiration, (c) mechanism of energy transfer, and (d) synthesis". There are final sections on distribution of enzyme systems and of metabolic activities and on nuclear-cytoplasmic relations. All the available evidence, we are told, is consistent with the view that RNA is supplied by the nucleus to the cytoplasm; the mechanism whereby the RNA is synthesized remains problematical but evidence is cited for supposing that it is mediated by DNA.

Chapter 2 deals with Proteins, enzymes and the mechanism of enzyme action and chapter 3 with Cellular respiration.

4527 Machlis, L. & Briggs, W. R. (Editors). **Annual review of plant physiology. Vol. 11.**
Annual Reviews, Inc., Palo Alto, California 1960 : $7.50 : Pp. vii + 468 : figs. : tables.

The first item in this year's volume [cf. XXIX, 4704] is a contribution on The submicroscopic structure of the cell, by F. Mercer, who points to some of the uncertainties that arise from the very drastic treatment that these delicate bodies undergo before they are examined in the electron microscope; in spite of this however the combination of electron microscopy and cell fractionation has revealed an intricacy of structure unsuspected a few years ago, and the review gives information on what is now known of structures such as the cell membranes, the endoplasmic reticulum, the cytoplasmic matrix, microsomes, mitochondria and chloroplasts. Much of the evidence suggests that the basic structure of animal and plant cytoplasm is similar, both animal and plant cells having free-space properties as well as permeability properties, the endoplasmic reticulum separating the two. The mitochondrion has been shown to have "an elegant and characteristic structure", which is described, and the membranes of both chloroplasts and mitochondria are shown to be differentially permeable rather than semipermeable. Though there is still some doubt about the details of the internal structure of the chloroplasts, certain correlations between function and structure can be made; the mode of origin and ontogeny of both chloroplasts and mitochondria remains an unsolved problem but it is difficult, we are told, to escape the conclusion that "the intracellular structure must be continually breaking and reforming".

In Vernalization and its relations to dormancy, P. Chouard gives a brief history of vernalization and outlines some of the more recent studies on vernalization in cereals, biennial dicotyledons, woody plants and perennials. An examination of the theory of phasic development shows it to be largely untenable. Hereditary differences in vernalization requirements have been demonstrated in strains within many wild species, the differences being conditioned by one or very few genes. Since conversion experiments have not been successfully repeated in any country where properly controlled conditions and pure strains are used, they are not considered. Various interpretations of the vernalization phenomena are considered, together with a number of unsolved problems, and a brief report is given of the material on the subject presented to the 9th International Botanical Congress.

A. Siegel and S. G. Wildman write on Some aspects of the structure and behaviour of tobacco mosaic virus, dealing first with its structure and composition; the infection capacity of the nucleic acid alone has been confirmed in this and a number of other viruses and the protein seems to play no genetic role in virus reproduction. The infectious RNA is said to contain "information to control its own replication" and also "a code that determines the production of specific viral protein", and it is suggested that "as newly synthesized viral RNA leaves the nucleus, it combines with microsomal protein to form a new class of microsomes which governs the synthesis of TMV protein subunits".

The other contributions include reviews on auxin action and on gibberellins as native plant growth substances and the volume ends with cumulative indexes to the contributing authors and to the chapter headings of the first 11 volumes.

Popják, G. (Editor).
**Biochemistry of lipids.**
Pergamon Press, London, 1960 : 40s. : Pp. x + 228 : figs. : tables.

This volume contains most of the papers presented in Section 18 of the Fourth International Congress of Biochemistry held at Vienna in September 1958. The arrangements for the meetings of Section 18 were made at the request of the organizers of International Colloquia on Biochemical Problems of Lipids. Some of the papers are presented in full whereas others, for one reason and another, appear only as abstracts. Those that will be of most interest to readers of *Plant Breeding Abstracts* are the following.

4528 *Dutton, H. J., Jones, E. P., Mason, L. H. & Nystrom, R. F. Labeling fatty acids by exposure to tritium gas.* (*p.* 38). (*Abst.*).

"When saturated fatty acids are exposed to tritium gas substitution of $^{3}H$ for $^{1}H$ occurs, whereas with unsaturated fatty acids 'addition' is the principal reaction. For example, when approximately 1 g. of methyl oleate was exposed as a rotated film to 1 c. of $^{3}H$ gas for 18 days, 8·3 mc. were incorporated into the ester. After saponification, alcohol exchange of labile tritium by distillation and acidification, fatty acids were recovered that contained 76·5% of the initial radioactivity. Gas chromatographic separations of the irradiated methyl oleate were carried out, and the vapors issuing from the thermal conductivity cell were trapped directly in scintillation solvent and their radioactivity determined. On oxidation and subsequent partition chromatography of the resulting mixture of acids, azelaic and pelargonic acids were found to be inactive; the long-chain monobasic acids were found to contain the radioactivity. Gas chromatography and radiochemical analysis of the methyl esters from these mono- and di-basic acids confirmed the inactivity of azelaic and pelargonic acids and showed further that the radioactivity curve coincided with the thermal conductivity curve of methyl stearate."

4529 *Karnovsky, M. L. & Wolff, D. Studies on the stereospecificity of lipases.* (*pp.* 53–59).

Experiments are described with two methods devised for testing the possibility that lipases might cleave symmetrical triglycerides stereospecifically to yield D–$\alpha\beta$-diglycerides. The fatty acids in the triglyceride substrate used were the same in all positions so that were the enzymes to attack specifically at one esterified primary carbinol group rather than at the other, this would be on purely steric grounds. Neither method demonstrated any stereospecific attack by the enzyme though it is thought possible that such demonstration might be effected under more suitable circumstances.

4530 *Hübscher, G., Dils, R. R. & Pover, W. F. R. Incorporation of* [$^{14}C$] *serine into mitochondrial phospholipids.* (*pp.* 89–91).

The incorporation took place only in the presence of adenosine triphosphate (ATP), coenzyme A (CoASH), cytidine monophosphate (CMP), $Mg^{++}$ ions and glutathione (GSH), suggesting that the pathway for the biosyntheses of phosphatidyl choline and phosphatidyl ethanolamine is different from that previously supposed.

4531 *Budnitskaya* [*Budnickaja*], *E. V. & Borissova* [*Borisova*], *I. G. Radiation effect on the lipid metabolism of plants.* (*pp.* 203–05).

Experiments are described in which it was shown that the lipoxidase of different plant species differs in its response to X-irradiation, the lipoxidase activity of wheat, barley, soya bean and pea showing an increase with radiation doses that caused a decrease in seedlings of dent maize.

4532 Polunin, N.
**Introduction to plant geography.**
Longmans, Green & Co. Ltd., London 1960 : 60s. : Pp. xix + 640 : 184 figs. : 1 map.

The title of this book, suggesting a comparison with Good's *Geography of the Flowering Plants* [cf. XXIII, p. 483], is liable to mislead, for while plant distribution is indeed discussed, it plays rather a minor role in the book as a whole. Indeed the volume is best described as a conflation of an elementary introduction to botany, a plant geography, an economic botany and a manual of synecology.

There are eighteen chapters all told. The first defines the author's conception of plant geography and is followed by a conspectus of plant classification. Chapter III deals with plant physiology and life form and chapter IV with dispersal and migration. Plant evolution is covered next while chapters VI and VII deal with plant distribution. Chapter VIII is concerned with cultivation and weeds and is

followed by a catalogue of the major crop plants. Ecological principles are expounded in chapters X and XI and the next five chapters describe the main communities of temperate, polar, montane, tropical and aquatic regions. The last two chapters deal with such miscellaneous topics as landscape, land-use classification, plant indicators and ecological techniques. The most valuable parts of this book are those describing arctic vegetation where the author writes as an authority. It is hard to escape the conclusion elsewhere that too much has been attempted, and for many of the aspects considered other books are likely to be preferred. The style of writing is involved and one is liable to be pulled up by such cryptic utterances as that "the nutrition of the Red Algae is much like that of the Phaeophyceae, except that many of the chemical products of photosynthesis and subsequent metabolism are different". It is also puzzling to find plant sociology, as developed by Braun-Blanquet, treated as something entirely different from synecology. While it is eminently reasonable to disagree with the Braun-Blanquet school of ecology it seems rather unreasonable to deal with the communities of temperate zones without reference to the painstaking work of this school.
The illustrations are largely borrowed from Brown's *Plant Kingdom* and there are some good photographs of arctic vegetation taken by the author.

4533 Linser, H. & Kaindl, K.
Isotope in der Landwirtschaft. (**Isotopes in agriculture**).
Verlag Paul Parey, Berlin & Hamburg 1960 : DM 86 : Pp. 442 : 214 figs. : 105 tables.

The work begins with a simplified explanation of atomic structure, radioactivity and the nature and production of isotopes. A number of general topics such as the dangers and difficulties associated with their use and their effects on living systems are discussed, the biological effects being interpreted on the basis of the molecular changes induced by radiations, though it is pointed out that much still remains to be explained as regards the actual reactions that take place in the living cell; although most radiation effects are thought to be indirect, their formulation according to the target theory nevertheless gives a close approximation in most cases.
Directions are given for the equipment of an isotope laboratory, and for the preparation of the main isotopes used in biological research; detailed descriptions are given of the methods of preparing the various marked reagents and of measuring radiation and there follows a series of chapters outlining the main lines of investigation in which radioactive isotopes have been employed in agricultural science. These include soil science, plant and animal nutrition, plant protection and plant breeding. Some favourable results attained from the artificial induction of mutations are cited [cf. XXVII, 3751–9]; these include mutants produced by various forms of irradiation as well as those resulting from treatment with radioisotopes such as $P^{32}$ or $Co^{60}$. Mention is also made of marked pollen in studies of fertilization. The possibility of employing radioactive isotopes for the direct improvement of yield or quality in agricultural crops is apparently still open to some considerable doubt.

4534 Hockensmith, R. D.
**Water and agriculture.**
American Association for the Advancement of Science, Washington : Publ. No. 62 : Bailey Bros. & Swinfen, Ltd., London 1960 : 45/– : Pp. viii + 198 : figs.

This volume consists of a collection of papers read at a symposium organized by the American Association for the Advancement of Science in 1958. Agronomists, conservationists, geologists and meteorologists, all recognized authorities in their respective fields, have contributed. The papers are divided into four sections; water for the future, water sources, water planning and water control. Although most of the subjects dealt with will be of direct interest only to North American readers, there are valuable chapters, with extensive bibliographies, on topics of wider interest. Howard Orville writes of the techniques currently available for weather modification. C. B. Tanner discusses the energy balance approach to evapotranspiration from crops. The latest chemical techniques for the control of aquatic and bank vegetation are dealt with by F. L. Timmons and D. L. Klingman.

4535 Horsfall, J. G. & Dimond, A. E. (Editors).
**Plant pathology: an advanced treatise. Vol. III: the diseased population, epidemics and control.**
Academic Press, New York and London 1960 : $22.00 : Pp. xiii + 675 : figs. : tables.

In the third volume [cf. 3373], the various aspects influencing the development of epidemics

are treated in a series of sixteen chapters, the last of which is The problem of breeding resistant varieties, by E. C. Stakman and J. J. Christensen. Many diseases that cannot be controlled at present by chemical means are enumerated and an account is given of some of the achievements during this century in breeding resistant varieties, first by selection and then by hybridization. The North American programme of breeding wheats resistant to stem rust is examined in detail; the characteristics of the main resistant varieties are outlined, with information on their fate in the ever-increasing battle against new biotypes; the degree of success—and failure—of the programme is summed up by the statement "the bread wheats of today can also be destroyed, but not so easily as those of 50 years ago. It takes more rust, more time, and more favourable rust weather to destroy them". A parallel situation is encountered in respect of the oat rusts and many other diseases: promising varieties resistant to one group of races have later fallen victim to another group or to some other organism that had not previously been regarded as important. Thus the lessons from the past are discussed; one of these is the necessity for greater knowledge concerning the biology of the pathogens, the biological interrelationships of host and pathogen and the nature of resistance, for testing against a greater range of pathogenic organisms in the early breeding stages, and for less initial optimism so as to prevent "psychology becoming mixed with pathology" as it is said to have done in some cases. The opinion is expressed that physiological specialization probably exists "within virtually all species of the various groups of pathogens, including viruses, bacteria, fungi, and nematodes", and reference is made to 1000 biotypes of *Helminthosporium sativum* (*Cochliobolus sativus*) and to at least 20,000 haploid biotypes of *Ustilago maydis* derived from two single sporidia of opposite sex by hybridization and mutation, though not all the biotypes, mercifully, seem to differ in pathogenicity. Hence pathologists now make no attempt to classify the pathogens into biotypes but usually content themselves with grouping them into races; how this is done is illustrated for *Puccinia graminis* var. *tritici*. In view of the situation described, it is suggested that the subject of "generalized resistance", effective against many or all biotypes, deserves much more thorough study. The value of grafting in combating infection is also mentioned. The authors believe that in the future, programmes of resistance breeding must be international, that there is need for more intensive research on the genetics, ecology, and physiology of hosts and pathogens and on the nature and variability of disease resistance and that "quality may sometimes have to be sacrificed in order to attain greater resistance and productivity, especially when the standard of quality is not based on real values".

4536 WAKSMAN, S. A.
**The actinomycetes: Vol. 1. Nature, occurrence and activities.**
Baillière, Tindall & Cox Ltd., 1959 : 100s. : Pp. vi + 327 : 107 figs. : 77 tables.

In his earliest studies on the actinomycetes Professor Waksman decided that there were grounds for differentiating them from both fungi and bacteria and it is on the basis of half a century of investigation by himself and many others that he has compiled this treatise upon them, the first volume of which is before us. Interest in the group has increased notably in recent years on account of their capacity to produce biologically active substances such as antibiotics, vitamins and enzymes; over 500 different antibiotics, we are told, have been isolated from them, some 25 of which have already found practical application as therapeutic agents.

Early investigations, starting with those of Cohn in 1875, and the confusion that surrounded them, are outlined. This confusion is referred to again in the chapter on classification, much of it arising from uncertainty as to whether to classify these organisms as fungi or as bacteria. Relationships with the bacteria are found to be the closest, in respect of most morphological, cytological and biochemical features, though certain resemblances to the fungi are nevertheless pointed out. Details are given of their characteristic morphology, cytology and life cycles and in a chapter devoted to variations, mutations and adaptations the various causes of the extreme variability of this group of organisms are analysed and the main types of variation described; the existence of physiological races differing in pathogenicity or in antibiotic production has further complicated the issue of what constitutes a species. Mutants induced by irradiation include strains with increased capacity for producing antibiotics. A number of cases of acquired resistance to antibiotics and to phage attack, of genetic recombination and of heterocaryosis are cited.

Further chapters are devoted to physiology, mineral metabolism, biochemical activities,

production of antibiotics and causation of animal and plant diseases. Chief among the latter are the scabs of potato, sugar beet and mangel, all apparently caused by what is at present known as *Streptomyces scabies*.

4537 Uphof, J. C. T.
**Dictionary of economic plants.**
Hafner Publishing Co. New York 1959 : $9.75 : Pp. 400.

To plough through one reference book after another in search of a single item of information is at best a tedious and time-consuming process, and all who have experienced the vexation of such a search in an attempt to find out whether a given plant has any economic uses or not will be extremely grateful to Professor Uphof for the present compilation. It includes, in a single but not unduly weighty volume, references to more than 6000 species used as sources of timber, food, spices, flavourings, medicines, fats, essential oils, fibres, rubber, dyes and other substances. Nor are the entries limited to the higher plant groups: bacteria, algae, fungi, lichens and bryophytes are also represented. The descriptions in the book are given under the scientific names of the species, the nomenclature used being "close to that of the Index Kewensis and its Supplements. Also the International Code of Botanical Nomenclature has been followed as far as it was feasible to do so." Other entries include synonyms and vernacular (chiefly American) names with cross references to the main entries. Useful features are the lists of genera under such entries as "Dyestuffs", "Fibres", "Rubber" and "Wood" and under botanical families. The descriptive accounts given under each species vary in length according to the importance of the crop, the basic information provided being, in addition to scientific name, authority, main synonyms and botanical family, notes on growth habit, geographical distribution and the uses to which the plant is or has been put. For oil plants, details of the specific gravity, iodine number and saponification value of the oil are also noted.

To dip into the book is fascinating, for it contains a wealth of information. Not only are the more obvious uses of plants listed, such as their use as vegetable, fruit, source of oil or rubber etc., but some of their less conspicuous virtues are also indicated. Thus on one page we may read of tomato both as a fruit and as a source of tomato seed oil used in soap manufacture; of *Lycopodium* powder used surgically and in pyrotechnics; of the stems of the fern *Lygodium scandens* made into baskets and hats, and also bags for keeping betel nuts in (in the Philippine Islands); and of various plants used as condiments and sources of glue, tea, gargles and febrifuges.

But, unfortunately, the book is not well written. Clarity, succinctness and unambiguity are all too often lacking. For example, again and again, a plant is referred to as a source of fibre, of wax, oil or dye, without any mention being made of what part of the plant is used for this purpose; sometimes the required information may be deduced from a fuller account of an allied species, but by no means always. Frequent awkwardnesses in wording may arise from the fact that English is not the author's native tongue and it is a pity that these and other Germanisms, such as timely for temporarily, the occasional failure to write adjectives from geographical names with a capital initial and the use of quotation marks of the German type, have not been eliminated by more careful editing. Apart from this, the number of typographical errors is exceptionally high, with often two or more on a page.

In spite of these defects, however, the book will certainly be extremely useful to all who work on or are interested in economic plants. The extensive bibliography, arranged under crops, products and geographical areas, will also be found valuable.

4538 35e beschrijvende rassenlijst voor landbouwgewassen 1960. (**35th descriptive varietal list of field crops, 1960**).
Rijkscommissie voor de Sammenstelling van de Rassenlijst voor Landbouwgewassen, Wageningen 1959 : f. 2.00 : Pp. 340 : tables.

This new list, like its many predecessors [cf. XXIX, 4710], provides information on all the most important varieties of the main crops grown in the Netherlands. The data, summarized from trials conducted throughout the country, are presented partly in tabular form and partly as descriptive notes on each variety. The English supplement forms, as usual, a useful index to the contents.

4539 Whyte, R. O.
**Crop production and environment.**
Faber and Faber, London 1960 : 63s. : Pp. 392 : 58 figs. : 6 tables : 31 plates.

Compared with the first edition which appeared in 1946 [cf. XVII, p. 101], the second may be regarded as a new book which continues the review of research on the relationships between environmental conditions and vegetative growth

and reproduction in economic plants from the point at which the first edition left off. Completely rewritten and reorganized, it deals almost exclusively with developments which have been reported since 1946. The initial chapters are concerned with research in the following fields: basic aspects of autoecology; morphogenesis; competition for light; biochemistry of reproduction; growth-regulating substances; chemical retardation of growth and flowering; and development before seed dormancy. An entirely new feature of this edition is a chapter describing the equipment used in experiments on the plant response to the aerial environment. A chapter on Genecology and breeding serves as an introduction to the greater part of the book, which is devoted to a survey of information on the physiology of specific crops or groups of crops in relation to their production and genetical improvement. The crops are dealt with under the following categories: herbage and fodder plants; other leaf and stem crops; roots and tubers; bulbs and corms; florist crops; fruit vegetables; fruit-bearing trees and shrubs; herbaceous fruits; seed fibres; oil crops; grain legumes and pulses; and cereals. Chapters on reactions of plants to temperature and light alone or in combination have been omitted from this edition, the effect of these factors being dealt with under the crops. There are only relatively few references to the work of Soviet physiologists, "partly as a reaction to the somewhat exaggerated attention given to them in the first edition, but also partly because there do not appear to have been any outstanding developments in the Soviet Union." Use of the review is facilitated by a bibliography which indicates the chapters in which the references occurred, besides the expected index of subjects and plant names. In conformity with the up-to-dateness of the text, most of the plates and figures are also new.

4540 **Herb. I.M.I. Handbook.**
Commonwealth Mycol. Inst., Kew 1960 : 12s. 6d. : Pp. 103 : 8 figs. : plates.

The many workers in various fields who have already benefited from the services offered by the Commonwealth Mycological Institute will be particularly pleased to know of the publication of this account of its work. Members of its staff have teamed together to describe not only the practices and techniques employed but also the principles followed. Dr. S. P. Wiltshire, recently retired director, gives a short history of the Institute, showing how its two main lines of activity, firstly, identification of fungi injurious to crops in Commonwealth countries, and secondly, accumulation and dissemination of information available in the world literature, have developed and continue to expand. The remaining twelve articles, all by members of the present staff, deal with the herbarium, how to describe a fungus, laboratory methods used in the culture collection, the treatment of pathogenic Phycomycetes, the recently initiated work of identifying bacteria important in plant pathology, and the publications of the Institute. Lists of staff and publications are given. The work of the Institute itself should be helped by the book: the information included on methods of collection should ensure that the most suitable specimens are submitted for examination.

4541 Reitz, L. P. (Editor).
**Biological and chemical control of plant and animal pests.**
American Association for the Advancement of Science, Washington : Publ. No. 61 : Bailey Bros. & Swinfen, Ltd., London 1960 : 52s. : Pp. xii + 273 : figs. : tables.

Perhaps the greatest value of this symposium, published under the auspices of the American Association for the Advancement of Science, will be to specialists in various fields of agricultural science who desire a general acquaintance with progress (up to 1957) in pest control. A more detailed inquiry into one particular topic will, in addition, be facilitated by the bibliographies included with chapters dealing with strictly scientific subjects, as well as by the unusually good index.

The last three chapters deal with what many still regard as the ultimate technique for pest control, breeding for resistance. E. H. Stanford contributes a chapter on breeding field crops for disease resistance and cites examples of successful programmes on lucerne, sugar beet, sorghum and other cereals. Great stress is laid on the problem of shifting physiological races of pathogens, and suggested solutions. The same problem is discussed in a chapter by J. R. Shay on breeding vegetables and fruit crops for disease resistance. The differences between monogenic and polygenic resistance and their relevance to this problem are outlined. A valuable portion of the chapter is a classification of representative cases of disease resistance in vegetables and fruits according to causal agent, mode of inheritance and field experience. R. H. Painter describes the work done

in Kansas and elsewhere on breeding plants for resistance to insect pests. Successes are outlined in programmes for breeding maize resistant to the earworm (*Heliothis zeae*), sorghum resistant to the chinch bug (*Blissus leucopterus*), maize resistant to the European corn borer (*Pyrausta nubilalis*) and wheat resistant to the Hessian fly (*Phytophaga destructor*). Methodology in contemporary programmes of insect-resistance breeding is well illustrated by a discussion of a programme now under way to incorporate resistance to the spotted aphid (*Therioaphis maculata*) in lucerne.

4542 **Handbook of Canadian cereal varieties of barley, field beans, flax, oats, spring wheat and winter wheat.**
Plant Products Division, Production Service, Department of Agriculture, Ottawa 1960 : unpaginated : plates.

Descriptions are given of the following additions to the Handbook [cf. XXII, p. 469]: the spring wheats Canthatch, Lake [cf. XXIV, 2810] and Pembina; the winter wheat Westmont [XXVIII, 291]; the oats Clintland 60 [cf. 217] and Russell; and barleys Betzes, Jubilee and Palliser. Developed at the Canada Department of Agriculture Research Station, Winnipeg, from Thatcher[6] x Kenya Farmer, Canthatch is resistant to biotypes of stem-rust races 11 and 15B to which Thatcher is susceptible, but is otherwise similar to Thatcher. Also bred at Winnipeg, Pembina [Thatcher x RL2564 (McMurachy-Exchange x Redman[3])], is outstanding for its good baking quality, being superior to Marquis. It is earlier and slightly more rust resistant than Selkirk but less resistant to lodging. Russell, developed by the Ontario Project Group from Garry x Mutica Ukraine x Abegweit[2], is similar to Garry in maturity and disease resistance, except for greater tolerance of *Septoria*. It has a lower hull percentage and higher yield than Garry in Ontario. Jubilee originated from Peatland x Regal x OAC21[2] x Husky at the University of Saskatchewan. A six-rowed, smooth-awned type for fodder only, it resembles Husky in all agronomic characters but is superior in yield. Palliser, a two-rowed spring barley, was developed from Vantage x Compana by the Dryland Area Project Group, centred at Lethbridge. Compared with Compana, it is higher in yield on brown and dark-brown soils, slightly later, more resistant to lodging, slightly better in pearling quality and equally resistant to shattering, but is inferior to Hannchen in malting and pearling quality.

4543 **Detailed descriptions of varieties o wheat, barley and oats.**
Nat. Inst. agric. Bot. Cambridge 1960 : unpaginated.

Another supplement to the handbook published in 1954 has been issued [cf. XXV, p. 456]. It consists of revisions of the lists of wheats, oats and barleys, together with detailed descriptions of five additions: Professeur Marchal, a winter wheat selected from (Hybride du Joncquois x Professeur Delos) x (Bastard II [Hybrid II] x Professeur Delos) at the State Agricultural Plant Breeding Station, Gembloux, Belgium; Élite Lepeuple, a winter wheat developed from Bellevue x Bersée by the firm of F. Lepeuple, France; the spring wheat Phoebus [XXV, 1880]; and spring oats Condor [cf. XXIX, 3757] and Manod [cf. 2443].

4544 Jugenheimer, R. W.
**Hybrid maize breeding and seed production.**
FAO UN, Rome 1958 : No. 62 : 20s. : Pp. xii + 63 : 92 figs. : tables.

With the publication of this comprehensive exposition of principles and procedures involved in hybrid-maize breeding and seed production, FAO adds to the already important role it has played in promoting national programmes in European and Mediterranean countries in this field of agricultural improvement. Much of the material was prepared initially in connexion with Dr. Jugenheimer's teaching duties at the University of Illinois. Part I consists of five chapters on general topics: the place of maize in world agriculture, botany and origin, maize genetics and the special aspects of heterosis and modification of the germ plasm by chromosomal and genic mutation. Part II is concerned with inbreeding, and Part III with breeding for a wide range of specific characters in maize, sweet corn and popcorn. Part IV on the development and testing of hybrids is followed by a final part on all aspects of seed production. A tabulated appendix supplies agronomic and other data on inbreds used in the north-central region of the USA and lists code numbers for predicting double-cross performance. Author and subject indexes, together with a bibliography taking up 63 pages, complete the volume.

4545 Hackbarth, J. & Troll, H. J. (Editors).
Anbau und Verwertung von Süsslupinen. (**Cultivation and utilization of sweet lupins**).
DLG-Verlag, Frankfurt am Main 1960 : DM 6.60 : Pp. 115 : 19 figs. : 36 tables.

The alkaloid-free lupins, which were first

released in Germany in 1934, represent one of the most noteworthy achievements of plant breeding, in that they constituted not merely an improvement on an existing cultivated plant but rather a new crop plant altogether. They were first described fully in a booklet by Hackbarth and Husfeld [IX, p. 487] and the present volume provides an up-to-date account incorporating the results of thirty years of experience with the new crop.

An outline is given of the various attempts to bring first *Lupinus albus* and then *L. luteus* and *L. angustifolius* into cultivation in Germany and the story of the selection, after the examination of 1·5 million single plants, of the first alkaloid-free lupins is retold; reference is made to ensuing improvements such as the selection of forms with soft seed coats, freedom from shedding, white seeds and rapid early development, all incorporated in the yellow-lupin variety Weiko III released in 1951. The variety Alteria is still better in early development and others referred to are Gülzower süsse Gelblupine [Gülzow sweet yellow lupin], Sulfa and the Dutch Palvo, all possessed of greater tolerance of unfavourable environments. Among the blue lupins the improvements are less noteworthy but reference is made to Müncheberger Blaue Süsslupine [Müncheberg blue sweet lupin], Gülzower süsse blaue Lupine and Grisa. Varieties of white lupin referred to are Nährquell [Food Source], Neutra, Gela, Ultra, Hansa, Pflugs Kleinkörnige [Pflug's Small-seeded] and Blanca. A Polish selection of yellow lupin in which the pods do not break off when ripe is the only form among the blue and yellow lupins found so far without this defect. Greater earliness and resistance to diseases such as *Fusarium* spp. *Macrosporium sarcinaeforme* and *Ceratophorum setosum*, as well as virus diseases, are mentioned among the directions in which further improvements are desired.

Information is given on the cultivation of sweet lupins in different countries of the world, all of them thought to be derived directly or indirectly from the six original alkaloid-free plants, three of *L. luteus* and three of *L. angustifolius*, selected in Germany. We are informed that the term "sweet lupin" is protected by patent and definitions are given of the different types in terms of alkaloid content. Thus a yellow lupin to be classed as alkaloid-free must have less than 0·004% alkaloid and a white or blue lupin less than 0·002%; there are intermediate classes known as low-alkaloid, containing 0·0041–0·06% in yellow lupins and 0·0021–0·04% in white and blue. The main characteristics of the cultivars of the three species approved for cultivation in eastern and western Germany, Holland, Denmark, Sweden, Hungary and Poland are described and their physiological characteristics are analysed. In breeding lupins for central and northern Europe efforts are being directed towards producing forms with a neutral photoperiodic reaction; responses to low temperature, humidity and other factors differ in the three species and indications are given as to the latitudes to which each is adapted and their soil, manurial and other requirements. Other topics dealt with are seed production, diseases and pests, the three species again being treated separately. Yielding ability in the sweet forms is said to be equal to that of the bitter forms in *L. luteus* and *L. albus* but not yet in *L. angustifolius*, in which species further breeding is called for.

The various purposes for which sweet lupins can be used are described and tabular data are given showing the composition of the sweet forms of all three species. A bibliography of over 100 titles completes the work.

4546 Hull, R.
**Sugar beet diseases.**
Bull. Minist. Agric. Fish. Fd., HMSO, London 1960 : 7s. 6d. : No. 142 : Pp. vi + 55 : 2 figs. : 20 plates.

The revised edition of this booklet, which is now issued ten years after the publication of the first, contains, as one would expect, a number of additions. The subject is dealt with under the three main headings, Seedling, Leaf and Root diseases, and within these categories virus, fungal and nutritional diseases, weather and chemical injury and genetical abnormalities are described. Control measures are suggested where appropriate. Injuries due to insect pests are described only where they may be confused with those given above and are fully dealt with in a companion booklet Sugar Beet Pests. Yellowing of the foliage is the response of sugar-beet plants to a number of diseases and adverse factors and, since a single disease may produce a range of symptoms while several diseases produce similar or overlapping symptoms, accurate diagnosis of the trouble may be difficult. The yellowing diseases are therefore treated as a group before being described individually, and a key to yellowing based on symptoms and time of year of occurrence is provided. Virus yellows, the most serious

disease of sugar beet in Great Britain, receives particular attention and deficiency diseases are fully discussed.

The booklet is profusely illustrated in colour and in black and white. The quality of the colour photographs is generally very good indeed although that of the black and white plates is rather more variable. The book is designed to be of use not only to plant pathologists but to all those engaged in growing or handling sugar beet.

4547 Singh, D.
**Rape and mustard.**
The Indian Central Oilseeds Committee 1958 : Pp. viii + 105 : figs. : 15 plates.

At the ninth general meeting of the Indian Central Oilseeds Committee in 1955, it was decided to invite specialists to write a series of monographs on oilseed crops, and this on the rapes and mustards grown in India is one of the fruits of the decision. The opening chapter gives a helpful analysis of past and present botanical nomenclature applied to the crops in question, which succeeds in lessening the confusion. The problem of local vernacular names is also considered, a comprehensive list of the names used in the various States being given. The second chapter is concerned with history, origin, distribution and production. Rape (*Brassica campestris* vars. *sarson* and *toria*), rai (*B. juncea*) and taramira (*Eruca sativa*) are each assigned a separate chapter, in which information on their morphology, floral biology, genetics and cytology is surveyed. A brief chapter is devoted to banarsi rai (*B. nigra*), cultivated on only a very limited scale in some States, mostly as a garden crop. Respectively, the next nine chapters deal with: embryology; induced tetraploids; intraspecific, interspecific and intergeneric crosses; the cytology, genetics and phylogenetical relationships of oleiferous and other *Brassica* species; the genetics of self incompatibility in the Indian rapes and mustards; oil and oilcake; possible methods of breeding and past and current breeding in the different States; cultivation; and utilization. A contribution on diseases by R. S. Vasudeva and another on insects by E. S. Narayanan complete the monograph. It is a pity more rigorous proof-reading did not eliminate the blemishes of misspellings and typographical inconsistencies or remedy the omission of some authors' names appearing in the text from the bibliography.

4548 Edgar, A. T. (Editor).
**Manual of rubber planting (Malaya) 1958.**
The Incorporated Society of Planters, Kuala Lumpur, Federation of Malaya 1960 : 63s. : Pp. x + 705 : figs. : tables.

The manual was first published in 1937, to become the standard work of reference on rubber planting in Malaya. Two of the sections, Timbers of Malaya and Surveying instruments and equipment, appearing in the first edition, have been reprinted in the 1958 manual, most of which has been revised, rearranged and to a considerable extent rewritten. The new edition, about half as big again as the 1937 manual, contains 21 sections, ranging from Land tenure in the Federation to Estate health and covering all topics about which planters may require guidance. The section on Planting material gives information on the results of selection, clonal seed, seed gardens, hand pollination and choice of planting material.

4549 Menon, K. P. V. & Pandalai, K. M.
**The coconut palm. A monograph.**
Indian Central Coconut Committee, S. India 1958 : Rs. 38.00 : 85s. : $11.95 : Pp. xvi + 384 : 150 figs. : 58 tables.

This monograph appears at a time when every effort is being made under the Second Five-Year Plan in India to make the country self-sufficient in coconut production. But all those interested in the coconut in other countries will also welcome this source of information on the various aspects of the multipurpose palm. Basing their work to a considerable extent on the earlier monograph by J. S. Patel, the writers, respectively Director of the Central Coconut Research Station, Kayangulam, and Joint Director of the Central Coconut Research Station, Kasaragod, have incorporated the advances made in practical and fundamental knowledge of the crop in India and other coconut-growing countries since the publication of the earlier work in 1938. Chapters on the economic status of the coconut and the possible origin of the crop, its general morphology and floral biology are followed by one on varieties and another on breeding. Varieties found in India and elsewhere are briefly described and the merits of six methods of improvement are discussed, viz. (1) introduction of varieties, (2) artificial selfing and selection in selfed lines, (3) natural and artificial crossing, (4) mass selection and strain building, (5) close and line breeding and (6) the plant-to-row method. The remaining chapters deal with climate and soil, production

of improved planting material, cultivation, soil conditions in relation to nutrition, plantation management, factors affecting nut yield, diseases, soil conditions in relation to health and disease, pests, tapping, abnormalities, utilization of coconut products and, finally, problems in agricultural and technological research. Among the topics discussed in the final chapter is the need for international co-ordination, attention being drawn to the desirability of establishing a unified scheme of technological research, a central information bureau and a central collection of world varieties, as well as organizing surveys of varieties and pests and diseases in the different countries in order to solve classificatory and nomenclatural problems. A separate bibliography is appended to each chapter. The illustrations are in the main good and an author index and an adequate but occasionally erratic subject index are provided.

4550 UMBREIT, W. W. (Editor).
**Advances in applied microbiology. Vol. 2.**
Academic Press, New York and London 1960 : $12.00 : Pp. xii + 384 : figs. : tables.

The second volume of the series [cf. 2157] covers a variety of topics ranging from waste treatment and techniques of brewery and vinegar manufacture to aerosol samples and membrane filters. There are also contributions on the microbiological transformation of steroids, the biological transformation of solar energy and microbiological assaying. A new feature is the inclusion of the reports of a symposium on engineering advances in fermentation practice.

# INDEX


Abdul Hameed Khan, 4113–4
Abdul Rehman Choudhry, 4482
Abercrombie, M., 3499
Abitbol, J., 4317
Abrams, R., 4436
Adams, M. W., 4029
Afanasiev, M. M., 4437
Aguado Marín, M., 3856
Aj-šen', L., 4514
Ajzenštat, Ja. S., 4418
Aksel, R., 3945
Al-Aish, M., 3516
Albu, E., 4375
Aleksandrov, A. V., 4388
Alekseeva, R. L., 3780
Alers-Alers, S., 4139
Alexander, C. B., 3999
Alexander, L. J., 3567
Alexei, O., 4315
Allard, R. W., 4440
Allen, G. S., 4344
Allen, O. N., 3517
Almeyda, N., 3713
Alvarez, L. E., 4095
Ames, B. N., 3407
Anciferov, N. G., 4109
Anderson, E., 3607
Andrásfalvy, A., 4185
Andrews, J. E., 3858
Andronicescu, D., 4189
Angelescu, H., 4191, 4357
Angulo Carpio, M. D., 3438, 4214
Anpilogov, M. Z., 3762
Arinštejn, A. I., 4131
Armstrong, J. M., 4034
Arzumanova, A. M., 4203
Ashman, R. B., 3893
Atabekova, A. I., 3518, 4469
Atabekowa, A. J., *see* Atabekova, A. I.
Atanasov, S., 4466
Atkin, J. D., 4371
Atsmon, D., 4200
Auerbach, C., 3435
Aufhammer, G., 3761
Aziz, M. A., 3953

B., T., 3688
Bahtadze, K. E., 4179
Bajsugurova, A. I., 3906
Bajwa, Manzoor Ahmad, *see* Manzoor Ahmad Bajwa
Baker, D. G., 3824
Baker, H. G., 3458, 3519
Baksay, L., 3520
Bal, A. K., 4358
Balašev, T. N., 4381
Balbinder, E., 3440
Bald, J. G., 3521
Bandlow, G., 3680
Banič, S., 3434
Bánkowska, H., 3887
Baranov, P. A., 3522
Barbieri, R., 4413
Bargioni, G., 4257
Bari, T., 4315
Barnes, B. S., 3935
Barnes, D., 3914
Barthelmess, A., 3523
Basamac, D., 4296
Basile, R., 3817–8
Basso, M., 4267
Battaglia, E., 3492
Batts, C. C. V., 3949
Bau, Y. S., 4144
Bauman, L. F., 3910
Beakbane, A. B., 4220
Beale, G. H., 3506
Becker, G., 3683
Begg, C. M. M., 4517
Bejan, T., 4309
Bell, A. E., 4519
Bell, W. D., 3524
Beni, G., 3773
Beno, D. W., 3517
Benson, A. P., 4092
Bergmann, L., 3485
Bernardo, F. A., 3969
Beskid, G., 3444
Best, R. J., 3525
Bhargava, P. D., 3776
Bhatnagar, M. P., 3776
Bhattacharyya, N. K., 4054
Bhavanishanker Rao, M., 4278
Bianchi, A., 3899
Binder, I., 4190
Bingefors, S., 4044
Bingham, R. T., 3526–7
Bird, L. S., 3714–5
Birecki, M., 3685
Bishop, C. J., 4230
Bistis, G. N., 3528
Biurkowska, M., 3887
Bjaanes, M., 3918
Björkman, I., 3768
Blagoveščenskij, A. V., 3470
Blaja, D., 4242, 4270
Błaszczak, W., 4067
Blixt, S., 4464
Blommaert, K. L. J., 4246
Blood, P. T., 4073
Bočev, B., 3884
Bočev, V. V., 4076
Bogart, R., 4519
Bogatova, M. G., 4210
Bogorad, L., 3524
Boldorini, L., 3882
Bolsunov, I., 3529, 4168
Bonvicini, M., 3789
Boone, D. M., 3530
Boos, G. V., 4388–9, 4391
Borisova, I. G., 4531
Borissova, *see* Borisova
Borrego, J., 4028
Bose, A. K., 3493
Bose, R. B., 4480
Bose, S., 4116
Boteanu, I., 3827
Botezan, V., 3919
Boureanu, C., 4315
Bowden, W. M., 3531, 4023
Bowman, J. C., 3410
Boyd, W. C., 4441
Bozova, L., 3788
Bozzini, A., 4364
Brachet, J., 3500
Bradshaw, A. D., 3996–7
Brauer H., O., 3737
Braun, H., 4089
Breslavec, L. P., 3850
Bretan, C., 4071
Breviglieri, N., 4251, 4302–4
Brewbaker, J. L., 3532
Briggs, W. R., 4527
Britten, E. J., 4047
Britton, D. M., 4286
Brock, T. D., 3533
Brodskaja, V. S., 3901
Brown, A. G., 3642
Brown, C. W., *see* Walkden Brown, C.
Brown, F. B., 3966
Brown, W. J., 3999
Brown, W. V., 3534–5
Brun, L. H., 3748
Bruni, B., 4305–7
Bubar, J. S., 3536, 3541
Buchli, M., 3916
Buckner, R. C., 3695, 4008–9
Bucur, N., 3809
Budnickaja, E. V., 4531
Budnitskaya, *see* Budnickaja
Bureva, V. B., 3381
Burmistrov, A. D., 4250
Burnett, J. H., 3426
Burton, K., 3503
Busson, F., 3740
Busuioc, G., 4445
Butănescu, G., 4508
Butany, W. T., 3982
Butică, A., 3861
Butin, H., 4330
Butler, L., 4399
Buttin, G., 3411
Buxton, E. W., 3537–8, 4470
Buzzati-Traverso, A. A., 3453

Caballero A. W., 4103
Căbulea, I., 3879
Cadman, C. H., 4288
Caffey, H. R., 3972
Calcatin, N., 4353
Callaham, R. Z., 3539–40
Callen, E. O., 3541
Callenbach, J. A., 3823
Calzada B., J., 4103
Campbell, A., 3382
Campbell, W. V., 3700
Campos, F. F., 3983
Candia Z., D., 3914
Capinpin, J. M., 4137
Carbiener, R., 3740
Carnahan, H. L., 4045
Carpenter, J. A., 4049
Carson, H. L., 3455
Cartier, D., 4361
Casini, E., 4302–3
Caspari, E., 3398, 3422
Cásseres, E. H., 4095
Cazacu, I., 4252
Čebotaeva, T. F., 4259

Celarier, R. P., 3542
Cervantes, J., 4086
Chai, C. K., 4519
Chandrasekaran, N. R., 4279
Chandrasekhariah, S. R., 4058
Chang, I.-H., 4164
Chang, T.-T., 3837
Chao, C.-Y., 3543
Chao, T.-F., 3801
Chaplin, J. F., 4169
Chapman, V., 3795
Charlanes, M., 3830
Chaudhuri, K. L., 4134
Chavan, V. M., 4276
Chennaveeraiah, M. S., 3544
Cheo, Y., 4164
Chevallier, M.-R., 3443
Chisci, G. C., 4036
Chiu, W.-F., 4164
Chopra, V. L., 4383
Chou, L.-K., 4096
Choudhry, Abdul Rehman, *see* Abdul Rehman Choudhry
Choudhury, J. K., 4480
Christensen, J. J., 3545
Christie, B. R., 4000
Chu, T. L., 4144
Chu, T.-M., 3448
Church, G. L., 3546
Cicin, N. V., 3851
Ciferri, R., 3789
Cireaşă, V., 4240
Cirillo, A., 4190
Čirkovskij, V. I., 4177
Clagett, C. O., 4127
Clark, G. M., 3824
Clark, R. V., 3833
Classon, D. H., 3808
Clausen, J., 3468
Clayberg, C. D., 4405
Čoboni, H., 3860
Cochran, F. D., 4359
Cockerham, C. C., 3864, 4519
Coculescu, Gr., 3771
Coe, G. E., 4152
Cojocaru, S. I., 4239
Cole, K., 4372
Coleman, O. H., 3696
Collin, R., 4521
Collins, W. K., 4167
Columbus, A., 3944
Comstock, R. E., 4519
Comstock, V. E., 4126
Constantinescu, G., 4310, 4315
Constantinescu, N., 4249
Conti, S. F., 4500
Converse, R. H., 3547
Cook, A. A., 4193
Cooper, D. C., 3548
Copeman, G. J. F., 3999
Cortesi, R., 3658
Cosmin, O., 3861, 3895
Cosmo, I., 4301
Craddock, J. C. (Jun.), 3814
Crampton, B., 3655
Crane, L. E., 3975
Crescimanno, F. G., 4274
Cristea, C., 4348
Cristea, M., 3896
Croce, F. M., 4312
Croisier, L., 3816
Culbertson, J. O., 4126
Curth, P., 4165

D'Amato, F., 3549, 3786
Dan, A., 3691
Dana, S. K., 4133
Dančev, S., 3877
Dániel, Á. F., 3892
Daniel, L., 4478
Darlington, C. D., 4522
Daskalov, H., 4465
Datta, A., 3488
Datta, A. N., 4135
Datta, R. M., 4133
Davidson, D., 3487, 3550
Davies, D. R., 3929
Davies, F. F., 3959
Davies, T. G., 3842
Davis, R., *see* Davis, R. H.
Davis, R. H., 3401, 3449
Davis, R. L., 4037, 4043
Davreaux, M., 3728
Day, A. D., 3933
d'Cruz, R., 3404
Dean, J. L., 3696
Dearborn, C. H., 4078
De Carolis, V., 3812
DeLamater, E. D., 3551, 3557
Delaporte, B., 3552
Delgado, S., 4086
De Marco, G., 3926
Demaree, K. D., 4452
Demidenko, B. G., 3960
Demidova, G. F., 4057
d'Emmerez de Charmoy, D., 4143
Deneuche, J., 4155
Derick, R. A., 3834
Deriščev, M. G., 4205
Desai, M. C., 4136
Dessureaux, L., 3399
De Torok, D., 4341
Devreux, M., 3553
Di Carlo, V., 3796
Dicke, F. F., 4479
Dickerson, G. E., 4519
Dickson, A. D., 3924
Dickson, J. G., 3517, 3764, 3913
Dijkstra, N. D., 4064
Dils, R. R., 4530
Dimitrov, P., 3467
Dimond, A. E., 4535
Dimova, R., 3878
Divakaran, K., 3955
Dobre, D., 4309
Dobzhansky, T., 3451
Doling, D. A., 4470
D'Oliveira, B., 3673
Donà dalle Rose, A., 4153, 4161
Dorman, K. W., 3651
Dornescu, A., 4199
Doty, P., 3415
Dotzenko, A. D., 4035
Doubly, J. A., 4127
Drayton, F. L., 3833
Dropkin, V. H., 3554
Dubinin, N. P., 4484
Dubois, H., 3740
Du Buy, H. G., 3674
Duman, A., 4240
Dumbravă, I., 3809
Dumitrache, V., 3861
Dumitrescu, M., 4347
Dumitrescu, O., 4445
Dunn, D. B., 3555
Dutt, N. L., 4140
Dutta, S. K., 3556
Dutton, H. J., 4528
Dworschack, R. G., 4503
Dyssa, F. M., 3476
Džadža, N. B., 4244
Džanelidze, V. S., 4264

Eberhardt, F., 4507
Echlin, P., 3551, 3557
Edgar, A. T., 4548
Ehrenberg, L., 4464
Ehrendorfer, F., 3457–8
Eibner, R., 4091
Eigner, J., 3415
Einspahr, D. W., 4325
Eldredge, J. C., 4479
Eliseev, E. I., 4284
Elling, L. J., 4038–9
Ellis, J. R., 4374
Enăchescu, G., 4189
Enčev, Ja., 3788
Endrizzi, J. E., 3961
Engelmann, N., 3419
Enloe, J. A., 4046
Erdtman, G., 3471
Eresen, H., 4362
Ergle, D. R., 3715
Ernst-Schwarzenbach, M., 3437
Erwin, D. C., 3559
Escuro, P. B., 3825
Espiritu, L. G., 3983
Esser, K.. 3385
Evans, H. J., 3484
Evdokimov, M. M., 4069
Everett, H. L., 3891
Evstigneeva, Z. G., 3805
Evtušenko, A. F., 4223

Faan, *see* Fan
Fair, E. W., 4247
Fairbairn, W. A., 4342
Fairbrothers, D. E., 3560
Faludi, B., 3892
Fan, H.-C., 4096
Farkas, G. L., 3561
Farkas-Riedel, L., 4185
Favarger, C., 3562
Favero, A., 3746, 3958
Favret, E. A., 3750, 3947
Fedorov, A. I., 4149
Federov, A. K., 3798–9
Fenaroli, L., 3867–8
Feofilatova, T. N., 3905
Fergus, E. N., 3695, 4008
Fernandes, A., 4380
Fernandes, R., 4380
Fernández, J., 4086
Ferrary, R., 3931
Fetner, R. H., 3563
Fiedler, H., 4079
Fincham, J. R. S., 3387–8
Finkner, M. D., 4158
Finkner, R. E., 4158, 4160
Finkner, V. C., 3697
Firsov, B., 4102
Fischbeck, G., 3761
Fischer, F., 4323

Fisher, H. M., 4007
Fisher, R. A., 4515
Fitzsimmons, R. W., 3772
Flangas, A. L., 3517
Flor, H. H., 3564, 4127
Forbes, I. (Jun.), 4011
Forti, R., 4301
Fosberg, F. R., 4268
Fraser, A. S., 4519
Frederiksen, R. A., 4126
Fregoni, M., 4263
Frey, K. J., 3831
Fritz-Niggli, H., 3437
Frizen, E. E., 3897
Frosheiser, F. I., 4038
Fryxell, P. A., 3565
Fudel', T. N., 3381
Fukui, J., 4453
Funabiki, K., 3477
Fyfe, J. L., 3566

Gabelman, W. H,, 4156–7
Gadre, G. V., 4276
Galan, C., 4053
Gallarate, G., 4145
Gale, J. S., 4256
Galeev, G. S., 3881
Galinat, W. C., 3908
Gallegly, M. E., 3567
Galston, A. W., 3602
Gandhi, S. M., 3776
Ganesan, A. T., 4499
Ganga Prasada Rao, N., 4106
Garaeva, K. G., 4080
Garber, E. D., 3568–9, 4471–2
Garber, K., 4097
Garcia S., A., 3920
Garde, A., 4392
Garry, B., 3407
Gaşpăr, I., 4072
Găureanu, I., 4353
Gejden, T. M., 4080
Gelin, O., 4464
Georgescu, M., 4255
Georgin, A., 3740
Gerasenkov, B. I., 3871
Gerassimova-Navashina, H., *see* Gerasimova-Navašina, E.
Gerasimova-Navašina, E., 3570
Gerhardt, P., 4500
Germanov, A. P., 4448
Geršenson, S. M., 3393
Gilbert, N., 4402
Gill, W. D., 3917
Giosan, N., 3771
Gladstones, J. S., 4049, 4056
Glass, B., 3463
Glavinič, *see* Glavinić
Glavinić, R., 4108
Gloushchenko, *see* Gluščenko
Gluščenko, I. E., 3571
Godeck, W., 3750
Godoy, E. F., 3727
Goldschmidt, R. B., 4518
Gončar, I. D., 3902
Goodwin, K., 4519
Gorini, L., 3431
Gorja, V. S., 3822
Gossling, B. S., 4483
Gottschalk, W., 4414
Gottschling, W., 4083
Gould, F. W., 3572
Goven, M. J., 4073
Govorov, N., 4390
Gower, J. C., 4519
Grădinaru, N., 4072
Grant, W. F., 3541, 3573
Grassl, C. O., 3574
Graves, A. H., 4272
Grebner, H., 3761
Greenleaf, W. H., 3712
Gress, M., 3509
Grigg, G. W., 3482
Grigsby, B. H., 3494
Groza, T., 4237
Gudkova, E. I., 3381
Guitard, A. A., 3757
Gupta, S. C., 4136
Gupte, A. K., 4276
Gursham Singh, 4194
Gusev, P. P., 4062, 4400
Guseva, N. A., 4400
Gwynn, R., 4178

Haber, A. H., 4378
Hackbarth, J., 4545
Hadžinov, M. I., 3904
Hagedorn, D. J., 4468
Hagen, G. L., 3575
Hagman, M., 4319
Hall, C. V., 3556
Haller, J. R., 3576
Hang, S.-Y., 4164
Hansen, A., 4025
Hansing, E. D., 3556, 3577
Hare, W. W., 3709
Harlan, J. R., 3991
Harm, W., 3397
Harney, P. M., 3578
Harnisch, W., 3944
Harper, J. L., 4524
Harris, R. H., 3791, 3808
Harrison, E., 4192
Harrison, R. L., 3873
Harte, C., 3579
Hartman, P. E., 3405–6
Hartman, Z., 3406
Harvey, P. H., 3698
Hashimoto, K., 3383
Hashimoto, T., 4500
Haskell, G., 4283, 4285, 4289
Haslett, A. W., 4516
Hassebrauk, K., 3767
Haus, T. E., 4035
Haut, I. C., 4286
Hayman, B. I., 3423
Hayman, D. L., 4015
Hebert, L. P., 3699
Hebert, T. T., 3803
Heddle, J., 3824
Heiken, A., 4075
Heinrichs, D. H., 4030
Heiser, C. B. (Jun.), 3580
Henderson, W. R., 4397
Henry, B. W., 3590
Hernández B., G., 4095
Hernandez, T., 3703
Hernandez, T. P., 3701, 3703
Herzenberg, L. A., 3407
Heslop-Harrison, J., 3581
Heyne, E. G., 3556
Hiesey, W. M., 3468
Hilkenbäumer, 4225
Hinrichs, H. A., 4262
Hintze, S., 4350
Hirschhorn, E., 3582
Hockensmith, R. D., 4534
Hof, J. V., 3494
Hoffman, G. M., 4128
Holm, G., 3937, 4415
Holmes, J. C., 3917
Holst, M. J., 3583
Holt, E. C., 4010
Holton, C. S., 3815
Homenko, A. A., 3862
Hondelmann, W., 4292
Honma, S., 4370
Hooker, A. L., 3839–40
Hooker, W. J., 4092
Hörberg, Y., 3934
Horsfall, J. G., 4535
Hoshikawa, K., 3804
Howard, H. W., 4369
Howe, W. L., 4040
Hrobryh, N. D., 4088, 4422
Hsieh, C.-C., 4164
Hu, S.-Y., 3584
Hubbeling, N., 3585
Hübscher, G., 4530
Hudjak, M. I., 3855
Huijsman, C. A., 4090
Hulanicka, E., 3416
Hulea, A., 3912
Hull, R., 4546
Humphrey, J. H., 3505
Hunt, I. V., 3998
Hunziker, J. H., 3586
Hurter, N., 4246
Hussainy, S. A., 4140
Hutchcroft, C. D., 3874
Hutchinson, M. T., 4181
Huttenen, E., 3752
Hvostova, V. V., 4456
Hyun, S. K., 3587

Iannaccone, A., 4411
Ichii, T., 4271
Igron, E. A., 4122
Ikeda, Y., 3436, 3588, 4494
Il'in, M. M., 4051
Ingledue, R. D., 3874
Ioniță, M., 4435
Iordăchescu, C., 4386
Ipekdžian, B. M., 3780
Irwin, H. S., 4213
Isac, G., 4254
Isbell, C. L., 3704
Islam, A. S., 3589
Issako, L., 4406
Ivanova, E. I., 3747
Ivanova, K. V., 4403, 4423
Iwasawa, M., 4130

Jackson, R. C., 3498
Jacob, F., 3411
Jaimangal Sahai, 4475
Jain, H. K., 3493
Jain, K. B. L., 3928
Jain, S. K., 3849
James, A. P., 4495
Janick, J., 4374
Jaroš, N. P., 4119–20

Jasso, R. G., 4028
Jenkins, B. C., 3660
Jenkins, J. A., 4404
Jennings, D. L., 4166
Jensen, S. D., 3890
Jewell, P. F., 3590
Jhuri, L., 4016
Jodon, N. E., 3971
Joham, H. E., 3714
Johnson, H. W., 4447
Johnson, L. P. V., 3945
Johnson, M. A., 3560
Jones, E. P., 4528
Jones, G. L., 4167
Jones, S. T., 3704
Joshi, A. B., 4017, 4429
Joshi, B. S., 4429
Jugenheimer, R. W., 3873, 4544
Jurcev, V. N., 3754
Jurgelsky, W. (Jun.), 4441
Jurbiţă, J., 4507
Juzepčuk, S. V., 3514

Käfer, E., 4487
Kaindl, K., 4533
Kalton, R. R., 4000
Kammacher, P., 4107
Kamra, O. P., 3932
Kamra, S. K., 3932
Kang, C.-N., 3984
Kaplan, R. W., 3445
Karner, L., 3684
Karnovsky, M. L., 4529
Kárpáti, Z., 4333
Kasatkina, I. D., 4488
Kašicina, E. S., 3811
Katarki, B. H., 3963
Katayama, Y., 4355
Kato, Y., 3481
Kaufman, H., 3431
Kaufmann, M. L., 3757
Kaul, R., 3821
Kazakova, A. A., 4356
Keegel, E. L., 4180
Keep, E., 4221
Keiter, F., 4519
Keitt, G. W., 3530
Kekuh, A. M., 4222
Keleman, G., 3892
Kemp, G. A., 4398
Kempanna, C., 4058
Kempthorne, O., 4519
Kendrick, E. L., 3815
Keosian, J., 3474
Kerzner, E. L., 4244
Kessler, B., 3591
Keszi-Harmath, E., 4253
Ketellapper, H. J., 4012
Khan, Abdul Hameed, *see* Abdul Hameed Khan
Khanna, K. L., 4141
Khanna, R. C., 4111
Kiellander, C. L., 4340
Kilbey, B. J., 4486
Kimber, G., 3795
King, J. R., 3706
Király, Z., 3561
Kisljuk, M. M., 3760
Kitani, Y., 3432
Kivi, L. E., 3940
Klaehn, F. U., 3592
Klitgaard, K., 4152
Ključareva, M. V., 3941
Knapp, E., 3593
Knight, R. J. (Jun.), 3594
Knight, R. L., 4221
Knox-Davies, P. S., 3913
Kobayashi, Y., 3986
Kobel, F., 3758, 4224
Kobert, H., 4323
Kocetov, S. P., 4234
Kohel, R. J., 4037
Kohiyama, M., 3394
Kok, I. P., 3393
Kolomiec, P. T., 3508
Komkova, M. V., 4069
Konarev, V. G., 3510
Kondakov, N. A., 4124
Kondo, A., 3970
Kondratjuk, Je. M., 3464
Kononalov, I. N., 3595
Konstantinov, P. N., 3380
Konzak, C. F., 3932
Korogodin, V. I., 4514
Kosan, J. H. D., 3489
Kostjanovskij, R. G., 3439
Kotani, A., 4293
Kotukov, G. N., 4146, 4151
Kováčik, A., 4207–9
Kovalenko, I. F., 4042
Kovalev, A. N., 3747
Kozubenko, V., 3880
Krapovickas, A., 3729–31
Krasnjuk, A. A., 3777, 3848
Krasočkin, V. T., 4061, 4063
Krishna Sastry, K. S., 4094
Krishnaswami, M. K., 4138
Krishnaswamy, P., 4279
Krueger, H., 4519
Kružilin, A. S., 4351
Krylov, A. V., 4080
Kubitschek, H. E., 3427
Kugler, W. F., 3716, 3724, 3728
Kuldip Singh Lobana, 4194
Kumari, K. Shama, *see* Shama Kumari, K.
Kundu, B. C., 4135
Kuperman, F. M., 3906
Kurtz, E. B. (Jun.), 3898
Kushima, K., 4130
Kušner, H. F., 3465
Kuzjurina, L. A., 4491
Kyle, J. H., 4438

Laberne, M. V., 4220
Lafontaine, J. G., 3612
Laínz, M., 4060
Lakiza, R. I., 4201
Lamb, K. P., 4066
Lambrev, Ž., 4408
Lamoreux, W. F., 4519
Lamprecht, H., 4458–63
Landrau, P. (Jun.), 4139
Lane, D., 3414
Langlet, O., 4322
Lanza, J., 3740
Lappo, A. I., 3859
Lapwood, D. H., 4084
Larsen, K., 4022, 4027
Lascols, X., 3885
Latter, B. D. H., 3425
Laude, H. M., 4046
Law, A. G., 3993
Lawrence, F. J., 4286
Lazăr, A., 4379
Lăzărescu, V., 4313
Lazareva, A. G., 4284
Lebsock, K. L., 3823
Ledingham, G. F., 3596
Lee, J. A., *see* Li, J. A.
Lefort, C., 3419
Lefter, G., 4243
Lehle, H., 4048
Lejeune, A. J., 3925
Lems, K., 3462
Leng, E. R., 3872
Lenkov, L., 3878
Leonori-Ossicini, A., 3818
Leppik, E. E., 3769
Lerman, R. I., 3595
Le Roy, H. L., 4519
Lesins, K., 4033
Leu, L. S., 4144
Leung, *see* Liang
Levine, M. N., 3817
Lewis, C. F., 4105
Lewis, D., 3384
Lewis, R. D., 3968
Li, J. A., 3946
Li, Y.-L., 3950
Liacu, A., 4240
Liang, H.-M., 4096
Liang, P.-Y., 3950
Lindegren, C. C., 3597
Lindqvist, K., 4377
Linser, H., 4533
Linskens, H. F., 3598
Lissouba, P., 3419–20
Little, R. R. 3599
Liu, C.-I., 4118
Liverman, J. L., 3898
Lixandru, G., 3809
Lizgunova, T. V., 4367
Ljačej, H., 3860
Ljaščenko, I. F., 3780
Lobana, Kuldip Singh, *see* Kuldip Singh Lobana
Löbl, D., 4394
Loeb, T., 3390
Loegering, W. Q., 3600
Loladze, V. R., 4314
Longwell, A., 3491
Lonnquist, J. H., 3883
Loper, J. C., 3405
Loseva, Z. E., 4131
Løvø, P. J., 4070
Lubenec, P. A., 4031
Lucenko, A. M., 3869
Luciano, A., 3728
Luippold, H. J., 4378
Luke, H. H., 3841
Luk'janova, M. V., 3756
Lukovnikova, G. A., 4366
Lundgren, D. G., 3444
Lundqvist, A., 3601, 3844
Lundqvist, A. J. A., *see* Lundqvist, A.
Lupu, A., 3863
Lutkov, A. N., 4481
Luzzati, D., 3443
L'vova, P. F., 4467
Lyall, L. H., 4395
Lysenko, T. D., 3689

M., U., 4401
Magg, G. W., 4148
McCune, D. C., 3602
Macer, R. C. F., 3742
McFadden, A. D., 3757
Machlis, L., 4527
McIlrath, W. J., 3524
McMillan C., 3603
Mahalin, M. A., 3851
Maini, Nirmal Singh, *see* Nirmal Singh Maini
Maissourian, N. A., 3604
Majčenko, Z. G., 4188
Majdannik, A. S., 3829
Majmudar, J. V., 3792
Majmudar, V. F., 3792
Makarov, A. A., 4354
Makus, A., 4059
Malik, M. M. S., 3949
Malinowski, E., 3887
Manu, S., 3919
Manughevici, E., 4227–8
Manzoor Ahmad Bajwa, 3953
Manžos, A. M., 4328
Mapes, M. O., 3486
Marchesi, G., 4417
Marciotte, C. V., 3725–6
Mar'jahina, I. Ja., 3906
Marjanen, H., 3790
Marmur, J., 3414–15
Martin, F. G. (Jun.), 4519
Martin, G. A., 4519
Martin, P., 4412
Martin, P. G., 3479
Martínez Vázquez, M., 3856
Masjura, P. D., 4077
Maškin, C. I., 4258
Mason, L. H., 4528
Mason, R. W., 4519
Mathan, D. D., 4404
Mather, K., 4519
Matsubayashi, M., 4074
Matzinger, D. F., 4167
Matthews, J. D., 3605
May, S., 4326
Mayes, M., 3903
Mayr, E., 3450
Medvedev, Z. A., 3392
Medvedeva, G. B., 3606
Mehre, K. L., 3607, 4013
Mejsel', M. N., 4513
Melville, R., 3409
Menon, K. P. V., 4549
Meppelink, E. K., 3806
Mero, A., 3774
Messeri, A., 3608
Messerini, A., 4304
Meurman, H., 3843
Mezâ, N., 4227–8
Michaelis, A., 3495, 3497, 4433
Micu, I., 4249
Middleton, G. K., 3803
Mihăescu, G., 4260
Mihov, A., 4465
Mikhaleva, E. N., 3595
Mileško, Z. F., 3850
Miller, J. C., 3701, 3703, 3705
Millington, A. J., 4050
Mirov, N. T., 3609
Mishra, A. K., 4492
Misra, G., 3979
Mitra, J., 3486
Mitroiu, V., 3770
Mitu, M., 4240–1
Miyake, T., 3428
Mizushima, U., 3970
Močalova, T. I., 4082
Mode, C. F., 4519
Mohamed, H. A., 3820
Moll, R. H., 3698, 3864, 4519
Möller, E., 3408
Momose, H., 3436
Monod, J., 3411
Montevecchi, P., 3787
Montgomerie, I. G., 4295
Moore, E. L., 3711, 4178
Morettini, A., 4238
Mori, T., 4074
Morley, F. H. W., 3454, 4030
Morrison, G. 4382
Morrison, J. W., 3610, 3629, 3936
Morrison, M. S., 3611
Moschini, E., 3786
Moseman, J. G., 3625
Moses, M. J., 3612
Moskov, I., 3788
Mota, M., 3491
Mota, M. E. G. de M., 3930
Mountain, W. B., 3613
Mousseau, J., 3419
Moutschen-Dahmen, J., 4432
Moutschen-Dahmen, M., 4432
Mühle, E., 3994
Mühling, G. N., 3494
Mujdaba, F., 4299
Muneta, J., 3614
Munteanu, I., 3919
Munteanu, O., 3751, 3861
Münzner, R., 3513
Murata, Y., 3977
Murphy, H. C., 3831
Murphy, H. J., 4073
Murray, J. C., 3615
Murti, K. S., 4277
Murty, B. R., 4173, 4176
Murty, G. S., 3928
Mušinskaja, L. G., 4057

Naf, U., 3616
Nagata, T., 3432
Nagato, K., 3986
Nagatomo, T., 4355
Nakamura, H., 4202
Naldi, L., 3957
Nandi, P., 4492
Nasypajko, V. M., 3810
Natti, J. J., 4371
Navarro F., M., 3920
Naylor, H. B., 4500
Nazarenko, B. P., 4093
Neagu, M. I., 4255
Neary, G. J., 3484
Nečas, J., 3942
Negovskij, N. A, 4159
Negreanu, E., 4310, 4315
Nelder, J. A., 4519
Nelson, P. E., 3554
Nelson, R. R., 3710, 3717, 3765
Nesterenko, P. G., 3476
Nesterov, Ja. S., 4233, 4236
Nevzgodina, L. V., 4456
Newcomb, G. B., 3618
Newsom, D. W., 3702
Newth, D. R., 3504
Nicholson, G. E., 4115
Nicholson, H. H., 4519
Nicolae, C.-Ţ., 3863
Nicolau, A., 4199
Niederhauser, J. S., 3619, 4086
Nienstaedt, H., 3620
Nikitenko, G. F., 3900
Nikolić-Vig, V., 4206
Nilan, R. A., 3932
Nilsson, B., 4320
Nilsson, F., 4290
Niqueux, M., 3964
Nirmal, K. D., 3675
Nirmal Singh Maini, 4194
Noll, A., 4163
Nolte, H.-W., 4473
Nonnecke, I. L., 4398, 4455
Norden, A. J., 3831
Nordestgård, A., 4184
Nordskog, A. W., 4519
North, C., 4373
Noulard, L., 3813
Novak, A. G., 4449
Novikov, V. A., 3734
Nuttall, V. W., 4387
Nystrom, R. F., 4528

Oarză, G., 4353
Oberdorf, F., 3866
Oberle, G. D., 3707
Obozov, A., 4339
O'Keeffe, L. E., 3823
Olejnikova, T. V., 4425
Olson, R. F., 4158
Olsson, G., 4196–8
Opara-Kubińska, Z., 3417–18
Oparin, A. I., 3473
Oppenheimer, H. R., 3621
Oprea, Ş., 4231
Oprişor, N., 4445
Oproiu, E., 3751
Oram, P. A., 3692
Osada, A., 3977
Osler, R. D., 3894
Oşlobeanu, M., 4297, 4299
Ostanin, A. M., 3853
Ostapenko, V. I., 4226
Ota, H., 4453
Ötvös, Z., 4409
Ownbey, M., 3622

Păcuraru, I., 3895
Page, A. R., 3423
Page, O. T., 3623
Pakuła, R., 3416
Palacios, G., 3894
Palilov, A. I., 4057
Pamfil, C., 3888
Panait, T., 4353
Pančenko, N. P., 3759
Pancho, J. V., 4137
Pandalai, K. M., 4549
Pandele, I., 4270
Pandey, K. K., 3391
Pantulu, J. V., 3952
Pao, W.-K., 3976
Parnia, P., 4232
Parsons, P. A., 4440
Pathak, G. N., 4475

Patau, K., 3675
Patterson, J. K., 3993
Patil, B. D., 4017
Patil, J. A., 4474
Patton, R. J., 3676
Paunero, E., 4021
Pavel, I. G., 4444, 4457
Pavlova, A. M., 4443
Payne, M. G., 4148
Pearson, L. C., 4039
Pederick, L. A., 4337
Peltier, M. A. G., 3981
Penrose, L. S., 3502
Pérez, G., 4086
Pergament, E., 4043
Perrin de Brichambaut, G., 3741
Pesho, G. R., 4040
Peterson D. F., 4160
Peterson, P. A., 3865
Petr, F., 3831
Petri, F., 3723
Phillips, E. W. J., 3624
Piacco, R., 3987
Piccioni, M., 3926
Pietro, B., 3956
Pirie, N. W., 3507
Pirovano, A., 4305–7
Pisarev, V. E., 3785
Plaut, W., 3480
Plomley, N. J. B., 4490
Plotnikov, N. Ja., 3380
Poenaru, I., 4297, 4313
Polacsay, R., 4231
Poleščuk, Ju. M., 4467
Poljanskij, Ju. I., 3469
Polunin, N., 4532
Ponamarenko, P. V., 4077
Pond, V., 3650
Pop, O., 3919
Popa, D., 4385, 4393
Popa, P., 4249
Popa, V., 4394
Popenoe, J., 3708
Popescu, E., 4296
Popescu, G., 4297
Popescu, S., 4298
Popják, G., 4528–31
Popova, D., 4428, 4465
Popovici, D., 4053
Portjanko, V. F., 3915
Potec, E., 4508
Potec, I., 4508
Pover, W. F. R., 4530
Powell, N. T., 3711, 4178
Powers, H. R. (Jun.), 3625
Powers, L., 4148, 4160
Praksin, S., 3774, 3860
Pratt, C., 4229
Precup, I., 4191
Priestley, W. G., 4373
Pritchard, R. H., 3626
Prosperi, V., 4305–7
Pruckov, F. M., 3967
Prywer, C., 3627
Pugovkin, V. N., 4506
Purser, A. F., 4519
Putt, E. D., 4211

Quadling, C., 3628
Quiñones, J. Salazar Vigil de, *see* Salazar Vigil de Quiñones, J.
Quittenbaum, G., 4044
Qureshi, S. A., 3783

Rai, U. K., 4427
Rajhathy, T., 3610, 3629, 3936
Rajkova, H. A., 3630
Rakitin, Ju. V., 4080
Ramachandran, M., 4279
Ramage, R. T., 3933, 3938
Raman, V. S., 4275, 4278–9
Ramirez, D. A., 3969, 4426, 4477
Ramírez, O. D., 4436
Rampal, L., 4316
Rao, J. T., 4138
Rao, N. Ganga, Prasada, *see* Ganga Prasada Rao, N.
Raper, J. R., 3631
Rapoport, 3439, 3441, 3447
Ratnaswamy, M. C., 3951
Rautenštejn, Ja. I., 4485
Razmadze, E. G., 4264
Reeve, E. C. R., 4519
Reeves, J. T., 4007
Refaey, F. Y., 3807
Reid, R. D., 4295
Reidel, I. B. M., 4434
Reimann-Philipp, R., 4362
Reitz, L. P., 4541
Rendle, B. J., 3624
Reusch, J. D. H., 4003–6
Reuther, G., 4496
Reynolds, J. D., 4470
Rhyne, C. L., 4104
Ricci Bitti, G., 4263
Richens, R. H., 4332
Richmond, T. R., 4105
Riedel, L. F.-, *see* Farkas-Riedel, L.
Reiger, R., 3495, 3497, 4433
Rigoni, V. A., 3730
Riker, A. J., 3676
Riley, R., 3781, 3794–5
Rives, M., 3379
Rizet, G., 3419–20
Rizzotto, N., 4269
Rjadnova, I. M., 4259
Röbbelen, G., 4365
Robertson, A., 4519
Robinson, H. F., 3864, 4519
Robinson, J. L., 3874
Robson, D. S., 4519
Rod, J., 3992
Rodger, J. B. A., 3917
Rodičev, S., 4102
Rodrigues, C. J. (Jun.), 3673
Rogler, G. A., 4024
Rommel, M., 3782
Roper, J. A., 3632–3
Ross, G. L., 3872
Ross, J. G., 4415
Rossi, J. C., 3723
Roşu, F., 4240
Rouhandeh, H., 3412
Rudkovskij, G. P., 4281
Rudner, R., 3432, 3440
Ruggeri, C., 3608, 4431
Rüsch, J., 4327
Rusconi-Camerini, G., 4154
Rush, G. E., 4160
Ryan, F. J., 3430, 3432

Saad, S. I., 4098
Saakjan, R. G., 4318
Sacco, T., 4265
Sackston, W. E., 3634, 4211
Sadanaga, K., 3838
Sadasivan, T. S., 3635
Sagajdak, I. N., 4352
Sahai, Jaimangal, *see* Jaimangal Sahai
Saharov, P. P., 3381
Šahsuvarjan, A. V., 4509
St. John, J., 4516
Sajoso, 3969
Säkö, T. J., 4235
Salazar Vigil de Quiñones, J., 3819
Salminen, M., 3845
Salokangas, K., 4384
Samoggia, V., 4430
Samorodova-Bianki, G. B., 3490
Samuels, G., 4139
Sánchez D., N., 4028
Sand, S. A., 4174
Sanderson, K. E., 3835
Sando, W. J., 3625
Sandu-Ville, C., 4379
Sangave, R. A., 4276
Santa María, J., 4501–2, 4504, 4510–12
Sárkány, S., 4185
Şarpe, N., 3771
Sastry, K. S. Krishna, *see* Krishna Sastry, K. S.
Sâto, S., 3665
Sauer, E., 4329
Săulescu, N., 3771
Saunders, A. R., 4442
Saunders, J. H., 4117
Săvescu, A., 4254
Šavel'zon, R. A., 4484
Savinova, N., 4393–4
Schaaf, H. M., 4024
Schaller, C. W., 3815, 3922
Schark, A. E., 4073
Scheffer, R. P., 3636
Schertz, K. F., 4441
Schildkraut, C., 3415
Schlehuber, A. M., 3784
Schneider, C. L., 4162
Scholz, F., 3733, 3738, 3944
Schönbach, H., 3637
Schreiter, J., 4079
Schröck, O., 3638
Schubert, B. G., 3639
Schulz-Schaeffer, J., 3640
Schuphan, W., 3739
Schütz, F., 4224
Schwanitz, F., 3456
Scossiroli, R. E., 4170
Sebesta, E. E., 3784
Seetharaman, R., 3980, 3982
Šejnina, S. L., 3778
Seliverstova, L. A., 4505
Şeptilici, G., 4507–8, 4493
Šerman, D., 3405–6
Šerstova, K. N., 3852
Seth, J., 3803
Ševčuk, T. N., 4125
Sevost'janov, S. P., 4150
Seyffert, W., 3424
Shah, Siraj-ud-Din, *see* Siraj-ud-Din Shah
Shama Kumari, K., 4018

Shands, R. G., 3923
Sharma, A., 3475
Sharma, A. K., 3475, 3488, 4016, 4358
Sharma, K. D., 3641
Sharma, S. L., 4141
Shaw, M., 3821
Shay, J. R., 3642
Shen, L.-M., 3950
Shilova, N. V., 3595
Shimizu, Y., 4360
Shult, E. E., 3643
Sibbitt, L. D., 3791, 3808
Sičkar', N. M., 3756
Sidorov, F. F., 3911
Simfendorfer, K. J., 4334–6
Siminel, M., 3919
Šimkus, G. T., 4041
Simmonds, N. W., 4192
Simon, M., 3816
Simons, M. D., 3838
Singleton, W. R., 3402
Singh, D., 4547
Singh Gursham, *see* Gursham Singh
Singh, H. B., 4429
Siraj-ud-Din Shah, 3953
Sirlin, J. L., 3478
Sirokov, A. Z., 3476
Sisler, W. W., 3921
Sivagnanam, L., 3954
Sizova, M. A., 4123
Skalinska, M., 3644
Skinner, F. L., 3645
Skok, J., 3646
Skurygina, N. A., 3779
Šmaraev, G. E., 4421
Smetannikova, A. I., 3595, 3647
Smirnov, A. I., 4055
Smith, C. E. (Jun.), 3648
Smith, E. L., 3784
Smith, G. T., 3989
Smith, J. B., 3446
Smith, P. E., 4454
Smith, W. E., 3939
Smith-Keary, P. F., 3433
Smith-White, S., 3460
Snegur, G. P., 4149
Snyder, W. C., 3649
Sociu, S., 4348
Soghaier, A. A. K., 3693
Sokolov, B. P., 3902
Sokolova, T. S., 4513
Sokolovskaja, A. P., 3736
Solotarev, E., 3745
Solymosy, F., 3561
Soost, R. K., 4416
Sosulski, F. W., 3993
Sparrow, A. H., 3386, 3650
Sparrow, R. C., 3650
Squillace, A. E., 3527, 3651
Srb, A. M., 3614–5
Srivastava, R. C., 4141
Stace-Smith, R., 4287
Stafijčuk, A. A., 3909
Stam, Ja. M., 4129
Stanciu, G., 4245, 4273
Stanford, E. H., 4046
Stanley, R. G., 3652
Staudt, G., 3653, 3797
Stauffer, J. F., 3654, 3764
Stauffer, R. C., 3472
Stebbins, G. L., 3461, 3655–6, 3995
Ştefan, I., 3770
Steffensen, D., 3677
Steffensen, D. M., 3657
Stein, H., 4156–7
Stein, O. L., 3657
Stepanova, E. M., 4282
Stern, K., 4321
Steward, F. C., 3486, 4526
Storoženko, Ju. G., 4085
Stovas, M. V., 3476
Strekalova, A. I., 4419
Strel'čenko, T. I., 3943
Strelkova, O. S., 3736
Strickland, W. N., 3396
Stroube, W. H., 3695
Stroun, M., 3658
Struckmeyer, B. E., 4156
Stubbe, H., 3452
Subramaniam, M. K., 4497
Subramanian, A., 3954
Sugarhara, Y., 4293
Sukačev, V. P., 4147
Sulbha, K., 4195
Sun, H.-Ju., *see* Sung, H.-Y.
Sung, H.-Y., 4489
Surikov, I. M., 3846
Surkov, V. A., 3847, 3857
Surykaj, G. M., 3854
Suvorov, V. T., 4407
Suzuki, I., 4293
Švedskaja, Z. M., 4351
Swaminathan, M. S., 4173, 4176, 4195, 4383
Symonds, N. D., 3501
Syobu, T., 4293
Syskova, M. V., 4420
Sytnyk, K. M., 3466
Szklarski, A., 4368

Takahashi, T., 4494
Tălpălaru, E., 4394
Tange, M., 3753
Tanifuji, S., 3496
Tapio, E., 4291
Tarkowski, C., 4186
Taylor, J. H., 3511
Teas, H. J., 3713
Teodorescu, S., 4507
Ter-Avanesjan, D. V., 4109
Teşu, C., 3809
Thirumala Rao, S. D., 4277
Thomas, H. R., 4437
Thomas, W. I., 4479
Thombre, M. V., 4136
Thompson, D. L., 3698
Thompson, K. F., 4369
Timariu, A., 4204
Tin, *see* Ting
Tinarelli, A., 3988
Ting, P.-T., 3984
Tinline, R. D., 3764
Tkačenko, A. A., 4159
Tomiyama, K., 3659
Tomková, J., 4175
Tomorogo, P., 3863
Tonkinson, S. M., 3484
Torge, D., 3751, 3861
Toropanova, T. A., 3429
Tossell, W. E., 4002
Tovmasjan, O. V., 3571
Townsend, C. E., 4014
Trentin, A., 3735
Troll, H. J., 4545
Truhaleva. N. A., 4051
Tschermak-Woess, E., 3483
Tsunewaki, K., 3660
Tucker, H., 3898
Tucker, J. M., 3661
Ţucra, I., 3863
Tupicyn, D. I., 4248
Tupý, J., 3512
Turks, L., 4121
Turner, B. L., 4213
Turner, E. M. C., 3832
Turner, P. D., 4183
Tuveson, R. W., 4471–2

Ul'džabaev, T., 4102
Ulinici, V., 3895
Ullstrup, A. J., 3662
Umbreit, W. W., 4550
Umekage, O., 3985
Uphof, J. C. T., 4537

V., E., 4401
Vaartaja, O., 3663
van Buijtenen, J. P., 4325
Van der Zaag, D. E., 4087
van Eijnatten, C. L. M., 3889
Vanithamony, P., 4142
Varis, E., 3800
Váróczy, E., 4478
Vazart, B., 4363
Văzvăzov, I., 4466
Veeraswamy, R., 3962
Veldeman, R., 4331
Veselovskij, I. A., 4081
Vigil de Quiñones, J. Salazar, *see* Salazar Vigil de Quiñones, J.
Viglierchio, D. R., 3664
Vijayasaradhy, M., 4142
Vik, J., 4349
Vincent, G., 4343
Vishveshwara, S., 4182
Voskan'jan, S. S., 4424
Vysockij, K. A., 4110

Wada, B., 3665
Wagenaar, E. B., 3775
Wagner, S., 3916
Wainstein, P., 4317
Waksman, S. A., 4536
Walczak, W., 3416
Walkden Brown, C., 3772
Walker, J. C., 3666
Walker, J. T., 4112
Wallace, A. T., 3841
Wallace, B., 3459
Walters, M. S., 4001
Watabe, T., 3985
Watanabe, T., 3413
Watson, G. S., 3422
Weaver, N., 4052
Weihing, R. M., 4052
Weijer, J., 3403
Welsh, J. N., 3836
Welvaert, W., 4331
Werner, K., 4215
Wettstein, D. von, 3667

Wheeler, H. E., 3841
Whitaker, T. W., 3678
White, P. R., 4341
Whyte, R. O., 4539
Wiberg, A., 3948
Wickerham, L. J., 4503
Wilkie, D., 4490
Williams, K. E., 3873
Williams, W., 4256, 4402
Willmer, E. N., 4525
Wilson, G. B., 3386, 3494
Wilson, J. A., 4010
Wimber, D. E., 3668
Winge, Ø., 3400, 3421
Winkel, A., 3866
Winkler, U., 3445
Winters, H. F., 3713
Withner, C. L., 3669
Wittmer, G., 4170
Wolf, E., 4496
Wolf-Ellmauer, H., 3445
Wolff, D., 4529
Wolff, S., 3679
Wood, L. S., 3763
Wood, R. R., 4160
Woods, M. W., 3674
Woods, P. S., 3511, 3670
Worsley, R. G. F., 4324
Wort, D. A., 4434
Wright, J. W., 3671
Wróblewska, Z., 4410
Wu, C.-S., 3801
Wu, S.-K., 3870
Wundsch, H. H., 3682

Yan, Y.-R., *see* Yen, Y.-J.
Yang, M.-H., 3973
Yeatman, C. W., 3583
Yen, C., 3755
Yen, D. E., 4439
Yen, Y.-J. 3976
Yotsuyanagi, Y., 4498
Young, H. C. (Jun.), 3784

Zaharčenko, S. A., 3687
Zamenhof, S., 4520
Zarubajlo, T. Ja., 3802
Zaumeyer, W. J., 4437
Zetterberg, G., 3442
Zillinsky, F. J., 3834
Zilm, B., 4362
Zimmerman, P. A., 4523
Zinder, N. D., 3389, 3395
Zitelli, G., 3818
Zobel, B. J., 3672
Zohary, D., 3995
Zub, L., 4186
Zuber, M. S., 3907
Zubkova, S. V., 3911
Žukovskij, P. M., 3743
Žuravel', B. N., 3859

## CANADIAN JOURNAL OF MICROBIOLOGY

A bimonthly journal published by the National Research Council of Canada, in English or French, and containing papers and notes describing original research in the various fields of microbiology. Equal consideration is given to all manuscripts regardless of country of origin. A total of 100 reprints of each paper is supplied free.

The Canadian Journal of Microbiology has been chosen by the Canadian Society of Microbiologists as its official scientific publication.

*Annual subscription* $6.00

*Manuscripts* for consideration should be submitted to the Editor-in-Chief, Canadian Journal of Microbiology, National Research Council, Ottawa 2, Canada.

Requests for *subscriptions* should be sent to Division of Administration and Awards, National Research Council, Ottawa 2, Canada, and remittances made payable to the Receiver-General of Canada, credit National Research Council.

## EUPHYTICA

### Netherlands Journal of Plant Breeding

Volume 8 (1959) contains 324 pages, among others, original articles on: Plant exploration and introduction, Breeding agricultural crops in the Netherlands, Induced mutations (with bibliography), The formation of physiologic races in plant parasites, Classification of wheat varieties on the basis of their genotype of necrosis, Breeding for resistance, Breeding maize for resistance to streak, Field resistance of the foliage of potatoes to **Phytophthora infestans,** Triploid sugar beets, Hybrids of ryegrasses and meadow fescue, Breeding for quality in cocksfoot, A method for selecting asparagus varieties with a long fibreless top, Breeding pointed-headed cabbage, Breeding non-bitter cucumbers, Inbreeding in **Cyclamen,** Neutronic mutations in peas and in tomatoes.

*Published three times a year, in annual volumes of* ± 300 *pages.*

*Annual subscription:* 15 *guilders* (*or* 4 *dollars*).

*In* 1960 *appears Vol.* 9. *Vols.* 1 (1952) — 8 (1959) *are still available at* $4.0 *per volume.*

Address all communications to:

**DR. H. de HAAN, NUDE, 66, WAGENINGEN, THE NETHERLANDS**

## AGRONOMY JOURNAL

Agronomists throughout the world have found the *Agronomy Journal*, monthly publication and official organ of the American Society of Agronomy, a source of up-to-date reports in agronomic research. Workers in the fields of forages and pastures, small grain improvement, corn, fiber crops and legumes, general cultural practices, and soil fertility, as well as closely allied fields of investigation, find articles of lasting interest in the *Agronomy Journal.*

Publication of research papers is open to members of the American Society of Agronomy.

Subscription prices:—$14.00 per year, U.S.A., Canada and Pan-American countries; $15.00 elsewhere.

AMERICAN SOCIETY OF AGRONOMY

2702 MONROE STREET MADISON 5, WISCONSIN.

## GENETICAL RESEARCH

**Editorial Board** C. H. WADDINGTON, F.R.S. (Chairman), CHARLOTTE AUERBACH, F.R.S., H. GRUNEBERG, F.R.S., W. HAYES, D. LEWIS, F.R.S., G. PONTECORVO, F.R.S., A. ROBERTSON. Executive Editor DR E. C. R. REEVE.

A new international medium for the publication of original work on all aspects of genetics—animal, plant, and microbial—the journal also includes papers in any field of research which has an important bearing on genetics.

The subscription price for an annual volume of 3 parts (published in February, July and November) is £5. Single parts £2. Copies may be ordered from your bookseller, or direct from the publishers.

**CAMBRIDGE UNIVERSITY PRESS**

**BENTLEY HOUSE, 200 EUSTON ROAD, LONDON, N.W.1**

# THE COMMONWEALTH BUREAU OF PLANT BREEDING AND GENETICS.

**School of Agriculture, Cambridge, England.**

*Consultant Director:*

PROF. SIR JOSEPH B. HUTCHINSON, C.M.G., Sc.D., F.R.S., Drapers' Professor of Agriculture.

*Director:* P. S. HUDSON, O.B.E., Ph.D.

*Assistant Director:* R. H. RICHENS, M.A.

*Assistants:* Miss T. ASHTON, M.A.
Mr. S. S. FLUSS, B.Sc., M.S.
B. E. HEISELER.
Miss O. HOLBEK, B.Sc.
Miss E. K. ROBERTS, B.Sc.
Mrs. M. E. STARK, B.A.


## Publications:

## PLANT BREEDING ABSTRACTS

Issued quarterly. One volume (4 numbers and annual indexes) per calendar year.

Annual Subscription 70/–. Subscribers (other than trade) resident in the British Commonwealth of Nations, and the Republics of the Sudan and Ireland are allowed a special discount of 20% on annual subscriptions sent direct to the Commonwealth Agricultural Bureaux at the address given below.

**Back Numbers.**—Volumes I–XXIX of *Plant Breeding Abstracts* are now available at the usual price of 70/– per volume including index.

**Important Note.**—Every effort is made to make Plant Breeding Abstracts as complete as possible and its notices of papers referring to plant breeding or the genetics of crop plants as prompt as possible. To aid in this, authors are invited to send to the Director copies of their papers immediately on publication.

## OTHER PUBLICATIONS OF THE COMMONWEALTH BUREAU OF PLANT BREEDING AND GENETICS

| TECHNICAL COMMUNICATIONS | s. | d. |
|---|---|---|
| Joint Publication No. 3. The Breeding of Herbage Plants in Scandinavia and Finland | 4 | 0 |
| Joint Publication No. 5. The Production of Seed of Root Crops and Vegetables | 5 | 0 |
| Joint Publication No. 8. Forest Tree Breeding and Genetics, by R. H. Richens | 5 | 0 |
| 4. An Outline of Cytological Technique for Plant Breeders | 5 | 0 |
| 6. The Action and Use of Colchicine in the Production of Polyploid Plants, by J. L. Fyfe | 3 | 0 |
| 9. Potato Collecting Expeditions in Mexico and South America. II. Systematic Classification of the Collections, by J. G. Hawkes | 7 | 6 |
| 12. The New Genetics in the Soviet Union, by P. S. Hudson and R. H. Richens | 6 | 0 |
| 13. The Use of Heterosis in the Production of Agricultural and Horticultural Crops, by Miss T. Ashton | 3 | 0 |
| 14. Technique of Breeding for Drought Resistance in Crops, by Miss T. Ashton | 2 | 6 |
| 15. Field Trials II: The Analysis of Covariance, by J. Wishart | 3 | 6 |
| 16. The Theory and Practice of the Backcross Method in Breeding of Non-Cereal Crops, by Mrs. M. Thomas | 15 | 0 |
| 17. Abstract Bibliography of Cotton Breeding and Genetics, 1900–1950, by R. L. Knight | 21 | 0 |
| 18. Principles and Practice of Field Experimentation, by J. Wishart and H. G. Sanders. 2nd Edition | 21 | 0 |
| New and Promising Varieties recently described in the Literature:— | | |
| Issue No. 7 | 2 | 6 |
| Issue No. 8 | 6 | 0 |

Orders should be addressed to:—

COMMONWEALTH AGRICULTURAL BUREAUX, Central Sales, Farnham Royal, Bucks, England.

*Loss in Transit.*—Claims for numbers of Plant Breeding Abstracts lost in transit will only be considered if notice of such loss is received within three months of the date of posting.

# COMMONWEALTH AGRICULTURAL BUREAUX

## JOURNALS PREPARED BY BUREAUX ON RELATED SUBJECTS

| | *Prepared by the* |
|---|---|
| Herbage Abstracts (50/-) | Commonwealth Bureau of Pastures and Field Crops, Hurley. |
| Field Crop Abstracts (50/-) | Commonwealth Bureau of Pastures and Field Crops, Hurley. |
| Horticultural Abstracts (70/-) | Commonwealth Bureau of Horticulture and Plantation Crops, East Malling. |
| Soils and Fertilizers (60/-) | Commonwealth Bureau of Soils, Harpenden. |
| Forestry Abstracts (70/-) | Commonwealth Forestry Bureau, Oxford. |

The annual subscription to the above journals is indicated in brackets. Subscribers (other than trade) resident in the British Commonwealth of Nations and the Republics of the Sudan and Ireland are allowed a special discount of 20% on annual subscriptions sent direct to the Commonwealth Agricultural Bureaux at the address given below.

## RECENT AND FORTHCOMING OCCASIONAL PUBLICATIONS ON AGRICULTURE AND FORESTRY

### Commonwealth Bureau of Horticulture and Plantation Crops, East Malling.

**Technical Communications.**

25. Abstract bibliography of fruit breeding and genetics to 1955. *Rubus* and *Ribes*. By R. L. Knight and Elizabeth Keep. 1958 .. .. .. .. 45s. 0d.

26. Horticulture in the British Commonwealth.—An outline. By D. Akenhead. 1958 .. .. .. .. .. .. .. .. .. .. .. 10s. 0d.

Digest 1. The bulk harvesting of orchard fruit. By G. E. Tidbury. 1958 .. 5s. 0d.

### Commonwealth Forestry Bureau, Oxford.

**Reprints of Leading Articles from Forestry Abstracts.**

15. Methods of testing the germination quality of forest tree seed, and the interpretation of results. By G. D. Holmes. 1951 .. .. ($0.60) 3s. 6d.

26. The storage of seed of temperate forest tree species. By G. D. Holmes and G. Buszewicz. 1958 .. .. .. .. .. .. ($0.80) 5s. 0d.

**The above publications are obtainable from Commonwealth Agricultural Bureaux, Central Sales Branch, Farnham House, Farnham Royal, Nr. Slough, Bucks, England.**

### Commonwealth Mycological Institute, Kew, Surrey.

Tobacco diseases, with special reference to Africa. By J. C. F. Hopkins 1956 .. .. .. .. .. .. .. .. .. .. 35s. 0d.

Common names of virus diseases used in the Review of Applied Mycology (1957) .. .. .. .. .. .. .. .. .. .. 6s. 0d.

An annotated list of seed-borne diseases. By Mary Noble, J. de Tempe, and Paul Neergaard. Pp. 159. 1958 .. .. .. .. .. 20s. 0d.

PRINTED BY W. HEFFER & SONS LTD., CAMBRIDGE, ENGLAND